Regional Operational Plan No. ROP.SF.2A.2022.12

Operational Plan: Assessment of Pacific Halibut and Groundfish Sport Harvest in Southcentral Alaska, 2019–2021

by

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and

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January 2022

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL OPERATIONAL PLAN NO. ROP.SF.2A.2022.12

OPERATIONAL PLAN: ASSESSMENT OF PACIFIC HALIBUT AND GROUNDFISH SPORT HARVEST IN SOUTHCENTRAL ALASKA, 2019–2021

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January 2022

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Approval

Title	Name	Signature	Date
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ABSTRACT

This project monitors age, size, and sex characteristics of Pacific halibut, several rockfish species, lingcod, and a few other species landed by sport anglers at the major ports in Southcentral Alaska. Data will be combined with harvest and effort estimates from Alaska Department of Fish and Game's statewide sport fish harvest survey to assess trends, evaluate changes in stock status, and design regulations that protect stocks and provide for long-term sustained yield. Data will be shared with the International Pacific Halibut Commission, the National Marine Fisheries Service, the North Pacific Fisheries Management Council, the Alaska Board of Fisheries, and the public. Survey areas will include Kodiak, Homer, Anchor Point, Deep Creek, Seward, Whittier, and Valdez.

Keywords: Pacific halibut, rockfish, lingcod, sport fishery, marine fishery, Southcentral Alaska

INTRODUCTION

PURPOSE

The goal of this project is to provide information needed for management of Pacific halibut (*Hippoglossus stenolepis*) and groundfish sport fisheries in accordance with the principle of sustained yield. Annual estimates of Pacific halibut sport harvest (by weight) are needed by the International Pacific Halibut Commission (IPHC) and North Pacific Fishery Management Council (NPFMC) to set harvest quotas for the upcoming year and evaluate the position of the charter boat harvest relative to the guideline harvest level. The data are also used by the NPFMC for analysis to address Pacific halibut allocation issues. Estimates of rockfish (*Sebastes* spp.) species composition are needed by the Alaska Department of Fish and Game (ADF&G) to apportion annual harvests by species, and corresponding harvest composition data are used to assess relative stock status and formulate management alternatives for consideration by the Alaska Board of Fisheries. Harvest composition data from lingcod (*Ophiodon elongatus*) fisheries are needed to evaluate the effects of regulatory proposals and monitor relative changes in abundance and recruitment.

BACKGROUND

The Southcentral Region (Southcentral Alaska) of the Alaska Department of Fish and Game (ADF&G) stretches from Prince William Sound westward through the Alaska Peninsula and the Aleutians. Participation in marine sport fisheries in Southcentral Alaska has grown steadily, more than doubling in the last 20 years. Sport fishing effort for all finfishes in salt waters between Cape St. Elias and Adak grew from about 200,000 angler-days in 1980 to about 565,000 angler-days in 1995 (Mills 1979-1994; Howe et al. 1995-1996). Since 1995, the marine finfish effort has ranged from 373,000 to 585,000 angler-days (Alaska Sport Fishing Survey [SWHS] database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish. Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/). The 2017 effort of about 426,136 angler-days represented 48% of the total statewide saltwater effort (SWHS). A major portion of the Southcentral marine fishing effort is directed at Pacific halibut and state-managed groundfishes, including rockfishes, lingcod, and sharks.

The need for data from the Southcentral marine sport fishery is underscored by increasing harvests, measured or perceived declines in abundance, and increased competition among user groups. Changes in management of commercial halibut fisheries in state and federal waters are also expected to affect state-managed groundfish species. For example, under the federal halibut "IFQ program," based on individual fishing quotas, shareholders are able to take their quotas at any time during the extended open season and in any area. This has caused a redistribution of

commercial fishing effort from traditional offshore grounds in the Gulf of Alaska to waters closer to port that are currently fished primarily by the sport fishing fleet. Potential challenges for management include increased commercial harvest of other groundfishes, such as rockfish and lingcod, competition between gear groups on the fishing grounds, and localized depletion of stocks, at least on a seasonal basis. All agencies and user groups involved in allocation conflicts and development of local area management plans will benefit from accurate data on these groundfish fisheries.

Species, age, and size composition are among the primary tools used to monitor and manage marine fish stocks. Sampling the harvest is often more cost-effective than fishery-independent surveys or tagging studies and can provide basic information for broad geographic areas. Although not a substitute for fishery-independent surveys of stock size, relative changes in these data can indicate environmental or fishery-induced changes in the composition of fish stocks (e.g., Hand and Richards 1991; Stanley 1991).

Pacific Halibut

Pacific halibut make up the majority of the sport groundfish harvest in Southcentral Alaska. Pacific halibut harvest in the region has grown dramatically, increasing to a peak of 401,000 fish in 2007 (Figure 1). The 2017 harvest made up nearly 65% (in number of fish) of the statewide sport halibut harvest. Cook Inlet halibut fisheries based primarily in Homer, Ninilchik, Seldovia, and Anchor Point have accounted for 61–82% of the Southcentral Alaska harvest since 1990 (Figure 1).

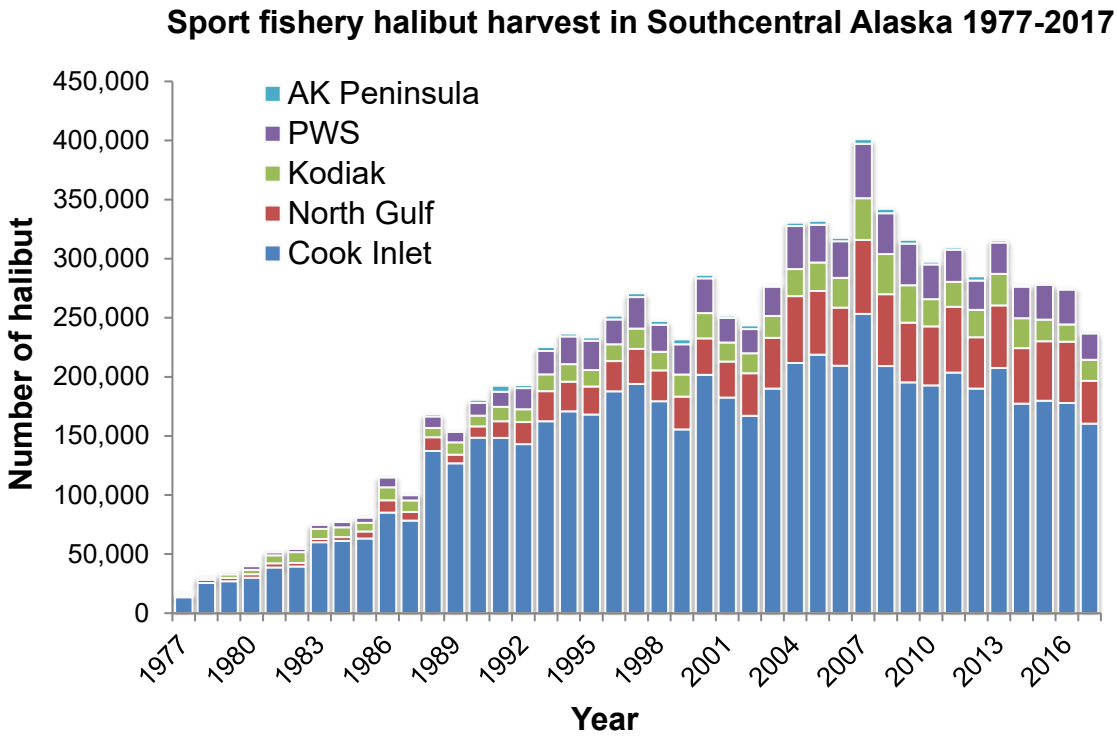

Figure 1.–Sport fishery Pacific halibut harvest in Southcentral Alaska, 1977–2017.

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited May 2016). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

The 1953 Halibut Convention, as amended by the 1979 Protocol, mandates that the International Pacific Halibut Commission (IPHC) manage the stock based on optimum yield (McCaughran and Hoag 1992). The IPHC conducts research on Pacific halibut population dynamics throughout the range of the stock, establishes the harvest strategy, and sets allowable levels of harvest in each of the 10 regulatory areas. Regulatory Area 3A stretches from the west end of Kodiak Island to Cape Spencer and encompasses most of Southcentral and part of Southeast Alaska marine waters.

The IPHC currently assesses Pacific halibut stock using a coast-wide model in which total biomass is apportioned among regulatory areas based on relative catch rates in the longline survey and bottom habitat area (Clark and Hare 2007), corrected for hook competition by species other than halibut, and adjusted for harvest taken prior to the mean survey date. Area 3A exploitable biomass was estimated at just under 58 M lb at the end of 2015 as apportioned under the current harvest policy (I. Stewart, Quantitative Scientist, Pacific Halibut Commission, personal communication). The exploitable biomass has been on a downward trajectory since the late 1990s but appears to be stabilizing.

Over the years, sport harvest has grown unconstrained by catch quotas such as those placed on the commercial longline fishery. Individual fishing quotas (IFQs) were implemented for the commercial longline fishery in 1995, providing fishermen a percentage share of the longline quota. Sport harvest was taken off the top of the total allowable harvest before the commercial quota was set. As a result, long-term increases in the sport harvest have caused allocation conflicts between commercial and sport user groups. Historically, the Area 3A sport charter boat fishery was managed under a guideline harvest level (GHL). If the GHL was exceeded, the North Pacific Fishery Management Council (NPFMC) could initiate a process to identify and implement control measures.

In April 2001, an attempt was made by the NPFMC to incorporate the Southcentral Alaska charter fleets into the existing IFQ program. The measure was intended to replace the GHL as a permanent solution to the allocation between the longline and charter halibut fleets. While the proposed IFQ incorporation was being considered, the GHL was exceeded from 2004 through 2007 with harvests equal to 100.5–109.6% of the GHL. In 2005, due to difficulties incorporating the charter fleet into the IFQ program, the council passed a motion containing a suite of alternatives for management of the charter fleet, including a moratorium, limited entry, direct allocation, and another IFQ program that incorporated recent fishery entrants. In March 2007, the NPFMC passed a motion to implement a moratorium (limited entry) on halibut charter boats. The moratorium was published in April 2009 and the final rule signed in January of 2010. The moratorium permits, or Charter Halibut Permits (CHPs), were required as of 1 February 2011 for charter vessel clients to catch and retain Pacific halibut.

In 2014, the NPFMC implemented a catch sharing plan (CSP) that would allocate Pacific halibut among the commercial and sport charter fleets, and include annual management measures implemented preseason to keep the charter fishery within its allocation, thereby replacing the GHL program. The plan also allows charter operators to lease commercial IFQs within a season to provide additional fishing opportunity for clients, and these fish would count toward the commercial catch limit. The CSP allocates Pacific halibut between the commercial and sport charter sectors, establishes bag and size limits annually, and provides for additional harvest opportunity for the sport charter fleet through use of commercial IFQs.

Changes in Pacific halibut growth rates and exploitable biomass, changes in stock assessment procedures, and allocation conflicts all underscore the need for continuing halibut sport harvest monitoring by ADF&G.

Rockfishes

About a dozen species of rockfish are taken in sport fisheries in Southcentral Alaska. Estimated harvest of all rockfish species combined has been increasing since the late 1990s, ranging from 22,000 fish in 1977 to a peak harvest of about 174,000 fish in 2016 (Figure 2). The North Gulf Coast fishery based in Seward has accounted for 40–57% of the Southcentral harvest since 1990.

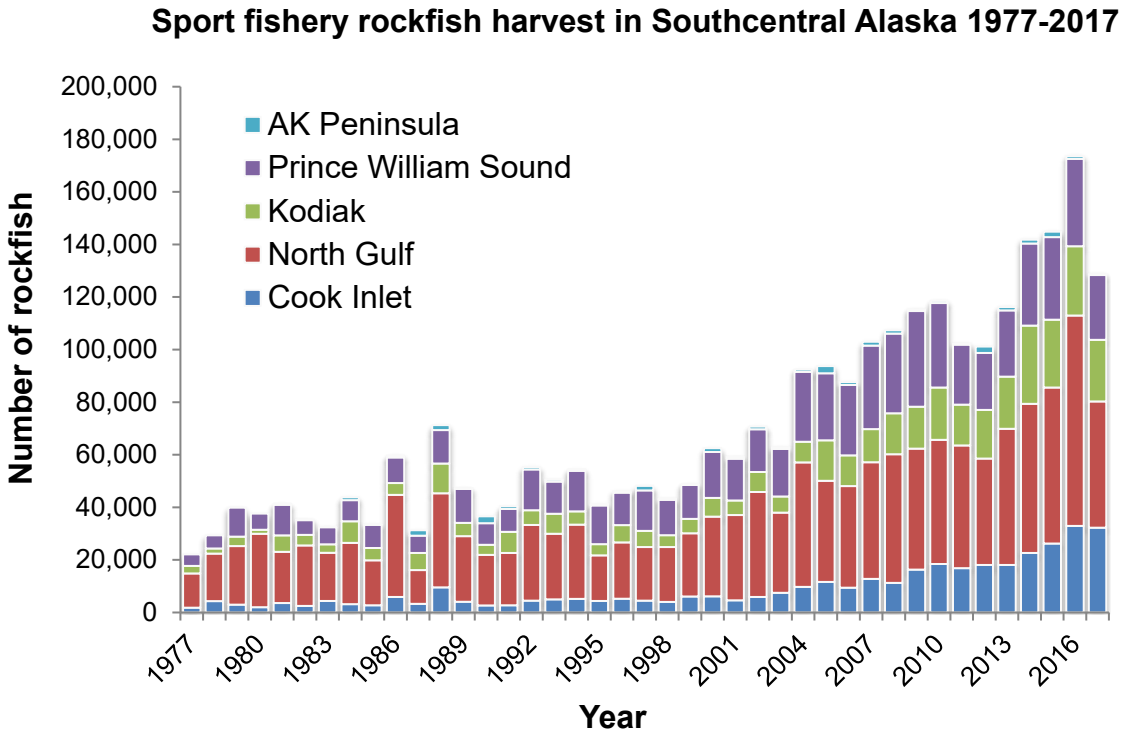

Figure 2.–Sport fishery rockfish harvest in Southcentral Alaska, 1977–2014.

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited May 2016). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Harvest estimates alone do not fully account for fishery removals. Rockfish swim bladders are physoclistous, or unvented. As a result, rockfish suffer decompression trauma when brought to the surface from depths in excess of 20 m (Parker et al. 2006; Hannah and Matteson 2007; Jarvis and Lowe 2008; Pribyl et al. 2009; Wilde 2009). Most species are believed to suffer mortality rates approaching 100% if caught below 30 m and released at the surface, which is the general practice of most anglers. However, recent research by Hochhalter and Reed (2011) suggests that release at depth of capture (recompression) can substantially improve survival rates of yelloweye rockfish. An estimated 20,000–97,000 rockfish have been caught and subsequently released annually in Southcentral Alaska since 1990. This program has collected information on the depth and distribution of rockfish caught and released since 2007, though discard mortality has not yet been estimated. Even though the species composition and survival of released rockfish is currently unknown, total mortality is higher than just the harvest estimates.

The sport harvest is a significant portion of total removals, especially in nearshore waters. Commercial rockfish harvest in state waters of the Cook Inlet and Prince William Sound areas (Cape Douglas to Cape Suckling) ranged from about 116,000 to 305,000 pounds during the recent 5-year period 2013–2018 (E. Russ, Fishery Biologist, ADF&G, Homer, personal communication, and unpublished ADF&G data). Estimates of the corresponding sport harvest biomass ranged from about 292,000 to 501,000 pounds during the same period (preliminary unpublished estimates, 2018 data unavailable). The sport fishery, therefore, has accounted for 59–81% of the total documented removals in these areas over this period. Rockfish harvest overall (excluding discard mortality) has remained relatively steady at 500,000–700,000 lb per year since 2000.

In the Kodiak area, the commercial fishery accounts for most of the rockfish removals. Commercial harvest of black rockfish (*S. melanops*) alone ranged from 81,000–246,000 lb during the period 2000–2014 (Ruccio et al. 2003; Mattes and Failor-Rounds 2005; Mattes and Stichert 2008; Sagalkin et al. 2009; Stichert et al. 2011; Hartill et al. 2012-2014; Nichols et al. 2015) whereas sport harvest of all species (dominated by black rockfish) ranged from 25,000 to 145,000 pounds (unpublished ADF&G data).

Increasing harvest and the lack of stock assessment information have long caused concern for the long-term sustainability of rockfish stocks throughout the northern Gulf of Alaska. Commercial fisheries are managed using harvest guidelines based on historical harvest levels, and sport fisheries are managed using bag limits but without harvest objectives or target reference points. There is no available time series of fishery-independent indices of rockfish abundance for state-managed species. Available life history data (e.g., Francis 1985; Leaman 1991), as well as numerous case histories from Alaska, British Columbia, Washington, Oregon, and California point to the ease of overexploitation and the difficulty of managing for sustained yield (Bracken 1986, 1989; Parker et al. 2000; Yamanaka and Lacko 2001). Many rockfishes are long-lived, attain harvestable size before reaching sexual maturity, and show a high degree of fidelity to reefs and other rocky habitats. Commercial and sport fisheries typically develop rapidly, harvest in excess of the annual surplus production, and deplete the standing stock before it is evident in the available data. Vincent-Lang (1991) suggested that limited data from commercial test fishing and the sport harvest near Resurrection Bay showed that the relative abundance of older black rockfish might have declined since the early 1980s. Current stock levels and virgin (unfished) biomass have not been estimated.

Because of the lack of information regarding rockfish stocks, the sport fishery has been managed using only bag limits. It is unknown whether the bag limits, combined with management measures for commercial and subsistence fisheries, are adequate to maintain these fisheries for the long term. The decline in Pacific halibut stocks, implementation of limited entry for charter halibut boats, and restrictions on charter halibut anglers may result in increased targeting of rockfish by charter operators as a way to increase angling opportunity under variable harvest restrictions.

Lingcod

SWHS estimates of lingcod sport harvest have only been available for all of Southcentral Alaska since 1991. Since then, harvest has declined from a high of about 14,000 fish in 1992 to about 7,100 fish in 1995. Harvest gradually climbed throughout 1990s and then increased abruptly to a level of about 20,000 fish in 2007 (Figure 3), which coincides with an increase in angler effort

during that year. Lingcod harvest in most areas was high through 2010, after which in each year, fewer lingcod were harvested than the year previous.

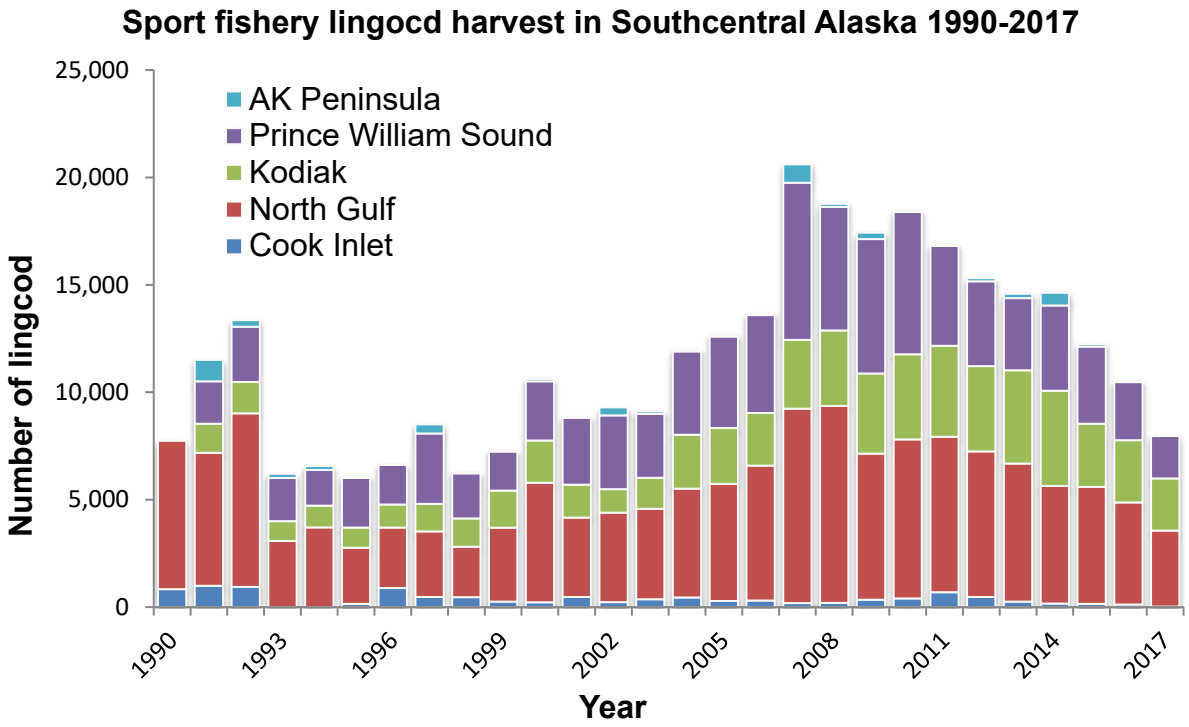

Figure 3.–Sport fishery lingcod harvest by area in Southcentral Alaska, 1991–2011.

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited May 2016). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

The sport fishery is the primary source of removals in nearshore waters. Preliminary estimates of lingcod sport harvests in state and federal waters of the Cook Inlet and Prince William Sound areas (Cape Douglas to Cape Suckling) ranged from about 154,000 to 657,000 pounds during the period 1992–2014 (unpublished ADF&G estimates). Commercial harvest in the same area and period ranged from 26,000 to 154,000 pounds (Trowbridge et al. 2008; Berceli et al. 2002; C. Trowbridge, Fishery Biologist, ADF&G, retired, and E. Russ, Fishery Biologist, ADF&G, Homer, personal communications). Thus, the sport fishery in state and federal waters of the Cook Inlet and Prince William Sound areas accounted for 83–93% of the combined sport and commercial harvest from 2005 to 2014. A similar situation exists in Kodiak. Sport harvest in Kodiak has been in the range of 13,000–92,000 pounds per year since 1992. Commercial harvest in the Kodiak area has been extremely variable, with a peak of 136,000 pounds in 1988. Commercial harvest since 1992 has ranged from 3,900 to 67,000 lb (Ruccio et al. 2003; Sagalkin et al. 2009; Stichert et al. 2011).

The North Gulf Coast lingcod fishery based in Seward was historically the most important lingcod sport fishery in the region. During the early period of this sampling program, ADF&G noted a lack of recruitment in the sport harvest. In addition, anecdotal reports of declining abundance in Resurrection Bay were substantiated with an ADF&G survey in 1992. The Alaska Board of Fisheries enacted reduced bag limits, a minimum size limit, closed seasons, and closed waters in 1993 for the Cook Inlet–Resurrection Bay area. Some of these regulations were

extended to the Prince William Sound, Kodiak, and Aleutian Islands areas in subsequent years as a precautionary approach to provide long-term sustainability to these fisheries. Despite these regulations lingcod harvest almost double from 2003 to 2010 and has steadily decreased through the present day. The reason for these fluctuations in harvest are unknown and warrant a precautionary approach to lingcod management in the future.

The status of lingcod stocks throughout the region is unclear. There is no long-term survey to provide a fishery-independent index of abundance, only relative measures based on port sampling or charter logbook data. Current assessment efforts are focused on using historical age, size, and sex composition, along with catch rates from the fishery or catch rates from other agency surveys to assess stock status. As with yelloweye rockfish, strip transect methods have been used to assess abundance in selected areas in southcentral Alaska (Byerly 2007). The current management approach is to structure the regulations to maximize reproductive effort and protect males during the nest-guarding season. Regulations include a minimum size limit and seasonal closure during the nest-guarding season. As with rockfish, lingcod harvest could rise with evolving restrictions on the halibut charter industry. Long-term collection of age, size, and sex data from the sport harvest is needed to assess the impact of new regulations and monitor stock status and rebuilding.

OBJECTIVES

PRIMARY OBJECTIVES

Objectives for the 2019–2021 seasons are as follows:

1) Estimate the mean net weight of Pacific halibut taken by each user group (charter or non-charter) in each subarea of Southcentral Alaska (Kodiak, Lower Cook Inlet, Central Cook Inlet, North Gulf Coast, Eastern Prince William Sound, and Western Prince William Sound), such that the mean weight estimates for each user group in each subarea are within 20% of the true mean weight at least 90% of the time.
2) Estimate the length composition of the Pacific halibut harvest by subarea such that the estimated proportions are within 0.20 of the true proportions at least 95% of the time.
3) Estimate the species composition by port of the rockfish harvest landed at Kodiak, Homer, Seward, Whittier, and Valdez during May through September such that the estimated proportions of each species are within 0.20 of the true proportions at least 95% of the time.
4) Estimate the age, length, and sex composition by port of the principal rockfishes landed at Kodiak, Homer, Seward, Whittier, and Valdez during May through September such that the estimated proportions are within 0.20 of the true proportions at least 95% of the time.
5) Estimate the age, length, and sex composition by port of the lingcod harvest landed at Kodiak, Homer, Seward, Whittier, and Valdez during July through September such that the estimated proportions are within 0.20 of the true proportions at least 95% of the time.
6) Estimate the geographic distribution of groundfish effort and harvest by user group (e.g., private and charter) at each port during May through September such that the estimated proportions are within 0.20 of the true proportions at least 95% of the time.

SECONDARY OBJECTIVES

1) Estimate the proportion of the Pacific halibut harvest that was cleaned (and carcasses discarded) at sea at each port. These estimates may be used to stratify estimates of mean weight or length composition (Objectives 1 and 2) at Homer. In addition, they provide information to evaluate potential bias of estimates at other ports due to cleaning at sea.
2) Estimate the proportions of released Pacific halibut that were caught on circle hooks versus noncircle hooks at each port. This information is needed to refine estimates of halibut release mortality in the sport fishery.
3) Gather data on the depths of capture for pelagic and nonpelagic rockfish that were released.
4) Estimate the proportions of released lingcod that were of sublegal (under 35 inches total length) and legal size (35 inches and greater) for ports with a minimum size limit regulation. These data will provide information on future recruitments and abundance indices, such as catch-per-unit-effort of legal-size fish, for future stock assessments.
5) Biological data will be collected from salmon sharks (*Lamna ditropis*), Pacific sleeper sharks (*Somniosus pacificus*), and spiny dogfish (*Squalus acanthias*) harvested in the sport fishery in order to estimate the age, length, sex composition, and spatial distribution of harvest. No sampling objectives are established for sharks because harvests are too small to generate reliable estimates for any given year. It is expected that age, length, and sex data will be compiled across a number of years and combined with commercial harvest sampling and other research programs to estimate life history parameters.
6) In addition to recording the primary statistical area fished, interviews conducted at Seward will include recording whether the anglers fished inside or outside Resurrection Bay (north or south of a line from Cape Aialik to Cape Resurrection). This information will only be collected from anglers that report fishing a statistical area that overlaps the bay boundary. This information is needed for evaluation of lingcod catch rates to address potential regulatory proposals dealing with opening of Resurrection Bay to lingcod fishing.

METHODS

STUDY DESIGN

Seven ports or beach launch areas are sampled to represent 6 major subareas within the central Gulf of Alaska (Table 1). These ports generally account for over 90% of halibut, rockfish, and lingcod landings in Southcentral Alaska (Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish [cited May 2016]. Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/). A single technician will be assigned to each port. Sampling will be conducted at harbors, boat ramps, beach launching sites, and military recreation facilities. Data collection will begin in mid to late May at all ports. Sampling will end in late August or early September.

Table 1.–Ports or beach areas that will be sampled within the central Gulf of Alaska in 2019-2021.

Ports or beach areas	Subarea
Kodiak (city)	Kodiak–Afognak
Homer	Lower Cook Inlet (LCI)
Deep Creek and Anchor Point	Central Cook Inlet (CCI)
Seward	North Gulf Coast
Whittier	Western Prince William Sound
Valdez	Eastern Prince William Sound

Sampling will consist of 2 primary components:

1) biological sampling for species, size, age, etc. (Objectives 1–5)
2) angler interviews to estimate the geographic distribution of effort and harvest at all ports (Objective 6), the proportion of the charter-caught halibut harvest that was cleaned and discarded at sea at each port (Secondary Objective 1 and needed to address Objectives 1–2), and other fishery information (Secondary Objectives 2–6).

At all ports but Kodiak, biological and interview sampling will be conducted on separate days. This separation of data collection reduces the potential for sampling bias (nonprobabilistic sampling of vessels) and is more efficient for gathering each type of information. Biological sampling and interviews will be conducted simultaneously at Kodiak because effort and harvest are low compared to other ports so both tasks can be handled simultaneously. Whittier was sampled under this methodology through the 2008 season; however, fishing effort increased to the point that biological and interview days need to be separated for sampling efficiency.

A randomized work schedule will be used to avoid bias of any parameters related to user group and to avoid bias in estimation of the spatial distribution of effort and harvest. Five workdays per week will be selected at random subject to the constraint that 2 days off must be consecutive. At Homer, Seward, Whittier, and Valdez, and in the Central Cook Inlet fishery, 3 biological sampling days and 2 interview days per week will be selected at random such that each type is distributed proportionally between weekends and weekdays. Holidays will be given no special treatment in terms of sampling effort, based on analyses done in 1997.

Ideally, sample sizes would be proportional to the total harvest over time by each user group, but at most ports, sampling becomes saturated during most of the season (i.e., there are more potential samples than time to sample them), and so samplers are only able to gather data from a small proportion of the total harvest during peak harvest periods. In many instances, the numbers of fish available to the sampler are not proportional to the estimated harvest by each user group because some landing sites are not sampled, fish are cleaned and carcasses are dumped at sea or in the harbor, or fish are kept on the boat and taken home to be cleaned later.

During 2003–2005, estimated mean weight of harvested halibut was often highly variable from month to month for each user group, and there was no consistent pattern from year to year (S. C. Meyer, Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, unpublished ADF&G operational plan FY2007). Possible explanations for the variability in mean weight by month include the following: 1) small sample sizes, particularly in May and September, 2) sampling the harvest from too few boats, 3) variation in the availability or catchability of certain size groups, or 4) temporal changes in the spatial distribution of the harvest. The variability is likely due to a combination of these factors.

Variability in mean weight does not result in biased estimates if the sample size over time is proportional to the magnitude of harvest. However, if a temporal component of the harvest is disproportionately sampled, and the mean weight during that period is especially high or low, estimates of mean weight for the season could be biased. Neither the SWHS nor onsite interviews from this project provide the information needed to estimate the temporal pattern of harvest by charter or private anglers. The charter logbook, however, does provide information on effort. The 2006 and 2007 operational plans (S. C. Meyer, Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, unpublished ADF&G operational plans FY2007, FY2008) compared unstratified and stratified estimates (stratified by month using logbook data for stratum weights) and found no differences for 2002–2006.

The practice of cleaning fish at sea also poses a risk of bias in the estimation of halibut statistics. This issue is more crucial when obtaining fish from the charter fleet because charters tend to clean and dispose of a higher percentage of the carcasses from their catch at sea than unguided anglers do (Table 2). In the past, some charter operators have cleaned smaller halibut at sea and returned to the dock with only the larger fish for photos or derby weigh-in. At most of the ports, when charter operators do clean at sea, they tend to clean all of the fish as a matter of convenience (Table 3). Private anglers in Whittier also clean most of their fish at sea because they are on small boats and often make overnight or multi-day trips. When only smaller fish are cleaned at sea, sampling only the fish brought to shore would bias length and weight estimates toward larger fish and could bias sex ratio estimates in favor of females. When all or nearly all fish are cleaned at sea, there would be little bias as long as anglers that clean their halibut in the harbor are no more likely to catch smaller or larger fish than anglers that clean at sea. Technicians at all ports will attempt to convince charter operators and other anglers that clean all fish at sea to return the carcasses to port for sampling.

Table 2.–Estimated percentages of the Pacific halibut harvest cleaned at sea, by port and user group, during the period 2016–2018.

		Percentage of halibut harvest cleaned at sea		
Port	User group	2016 (%)	2017 (%)	2018 (%)
Kodiak	Charter	0	2	0
	Private	3	3	4
Deep Cr.–Anchor Pt.	Charter	7	8	3
	Private	6	7	4
Homer	Charter	62	67	64
	Private	28	23	32
Seward	Charter	26	26	11
	Private	11	23	9
Whittier	Charter	60	53	49
	Private	73	80	72
Valdez	Charter	0	0	0
	Private	3	0	1

Table 3.–Estimated percentages of Pacific halibut cleaned at sea only among boat trips where cleaning at sea occurred, 2016–2018.

		Percentage of halibut harvest cleaned at sea for boats where cleaning at sea occurred		
Port	User group	2016 (%)	2017 (%)	2018 (%)
Kodiak	Charter	11	26	20
	Private	82	100	100
CCI	Charter	92	94	100
	Private	90	92	85
Homer	Charter	98	93	97
	Private	94	89	98
Seward	Charter	92	95	85
	Private	85	93	100
Whittier	Charter	99	100	97
	Private	100	98	99
Valdez	Charter	0	–	–
	Private	100	–	29

Note: An endash indicates no boats cleaned at sea.

Design by Port

Kodiak

The city of Kodiak is the only population center with an appreciable level of halibut or groundfish sport harvest in the Kodiak area. The port of Kodiak accounted for about 50% of the Pacific halibut harvest, 68% of the rockfish harvest, and 60% of the lingcod harvest by sport anglers in the Kodiak area in 2014 (Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish [cited May 2016]. Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/). The remainder came from outlying areas such as Larson Bay, Old Harbor, and Port Lions, which are places where it is impractical to implement a sampling program. Harvest landed at Kodiak is therefore assumed to represent the entire area.

Biological sampling and angler interviews will be conducted between 1430 hours and 2130 hours at St. Paul's Harbor, St. Herman's Harbor (Dog Bay), and the U.S. Coast Guard Base (Appendix A1). This period has captured the majority of returning anglers in past years. The distance between the 3 harbors is too great to intercept all returning anglers. Starting at approximately 1430 hours, the technician will begin sampling at the initially assigned area then rotate systematically through the 3 sites in a predetermined order. The technician will stay at each site long enough to interview returning anglers and sample available fish. Each site is visited 2–3 times per day on average using this scheme.

In recent years, many of the Kodiak charter boats have delivered their sport-caught fish directly to 2 processing facilities, making it difficult to obtain samples. Sampling was conducted at both

processors from 2005 through 2007 and again from 2009 through 2011. In 2008 and from 2012 to present, only 1 processing facility has processed sport-caught fish. The technician will interview the charter skipper in the harbor and may follow up with sampling later, at the convenience of the processor. Scheduling may have to be adjusted in order to accommodate this. This sampling is neither systematic nor random. Therefore, the technician will attempt to make the sample representative by allocating sampling effort among charters that do and do not use this processor in proportion to their share of the charter harvest.

Some charter services in Kodiak clean their halibut and dispose of carcasses at sea. The percentage of charter halibut harvest cleaned at sea has remained low since 2009 (Table 2), possibly because of increased use of fish processing plants. To minimize potential bias in estimation of age and length composition, charter services that clean at sea will be asked to voluntarily retain the carcasses of all fish cleaned at sea. No portion of the daily harvest of a species category (halibut, lingcod, rockfish, sharks) from any one boat will be sampled unless all fish or cleaned carcasses of that species are returned to port.

Homer

There are numerous exit points in the Lower Cook Inlet fishery, including the communities of Homer, Seldovia, Nanwalek, and Port Graham, as well as several hundred private docks along the south side of Kachemak Bay from Bear Cove to Kasitsna Bay (ADF&G 1993: page A-37). Because it would be cost-prohibitive to sample all exit points, the fishery will be sampled only at the major access point—the city harbor on the Homer Spit (Figure 4).

Biological sampling will generally start at 1400 hours, but the technician will be free to begin sampling earlier on weekends or on bad weather days in order to intercept the majority of landings. The harbor and associated facilities cover a large area, making it difficult to distribute sampling effort in a representative manner across both user groups (charter and private). When sampling fish that are cleaned in port, the technician will spread sampling effort between the public fish cleaning stations at Ramps 4 and 6 (Figure 4), boats cleaning fish on deck, the boat ramp, the fish-cleaning table near the salmon enhancement lagoon, and numerous charter cleaning facilities in an effort to allocate the samples throughout the day's landings. Emphasis will be placed on obtaining data from private-caught fish because of their lower availability. Ideally, due to the high volume of charter-caught fish, approximately 4 to 5 charter boats would be randomly selected from a list of all known charter vessels for biological sampling each day. However, the reality of sampling in the dynamic atmosphere of a harbor makes this problematic because upon arriving at the dock, the sampler may find any of the following scenarios: 1) none of those vessels have gone out that day, 2) some have already returned and cleaned all or a portion of their harvest, or 3) all returned at once, forcing a sampler to choose a single boat from amongst that list. Instead, the sampler will systematically move through the cleaning locations (cleaning tables, charter offices, and the vessels that clean fish on their decks) to obtain samples. Sampling will also be distributed between private and charter-caught fish throughout the shift to spread samples over time and avoid selecting for early or late-returning boats.

About sixty-five percent of the halibut caught by charter anglers during the last 3 years in Homer were cleaned at sea (Table 2). The estimated mean weights (from a weight-length relationship) of halibut cleaned at sea versus halibut cleaned in port were significantly different before 2000 and after 2003 (Table 4). Because there are potential differences in mean weight, halibut cleaned at sea will be sampled from Homer charter vessels that have indicated in past interviews that they

clean fish at sea. On the day before each biological sampling day, the technician will select up to 3 charter boats from a randomized list of charter vessels that clean halibut at sea and request the skipper to retain all carcasses of fish cleaned at sea the following day. This arrangement should minimize inconveniences to the charter operations and provide adequate data to detect and correct for this potential bias. These fish will only be sampled if all fish from a vessel are available to be sampled.

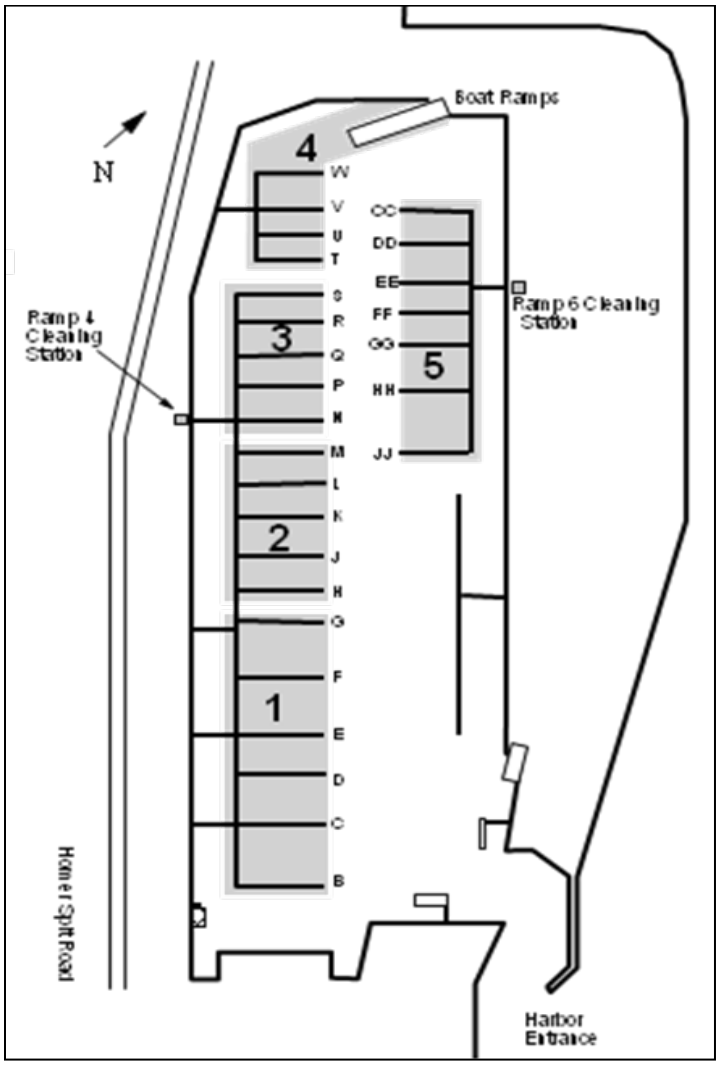

Figure 4.–Homer harbor interview areas used in 2019.

Interviews will be conducted during 1200–1900 hours, which is the same schedule used in 2006 through 2015. Before 2006, interview shifts started at 1300 hours, and the distribution of interviews over time indicated that more boats were returning earlier than later in the shift. The change to an earlier shift in 2006 appeared to capture more boats returning earlier and resulted in a more symmetrical distribution of interviews over time.

The Homer harbor is too large and effort is too great to obtain interviews from all returning boats. The harbor is therefore divided into 5 areas, and interviews will be conducted for 1 hour in

each area (Figure 4). The initial order of areas is assigned randomly then "rotated" systematically, repeating areas sampled each day in order to fill out a 7-hour shift (Appendix A2). Under this design, all areas and hours will receive equal sampling effort during the season. Because boats may offload in one area and tie up in another, the technician will contact and obtain interviews from boats tying up or offloading in the assigned area, unless previously interviewed.

Table 4.–Estimated mean weights and results of *t*-tests comparing Pacific halibut cleaned at sea versus those cleaned in port at Homer, 2001–2018.

	Cleaned in port		Cleaned at sea				
Year	Mean weight (lb)	*n*	Mean weight (lb)	*n*	*t* value [a]	*P* value	df
2001	21.2	511	19.3	161	1.74	0.084	418
2002	20.3	547	17.7	120	1.9	0.059	240
2003	21.7	643	21.8	147	-0.11	0.915	268
2004	21	1,224	16.7	169	5.54	<0.001	427
2005	18.8	1,078	14.1	158	5.36	<0.001	485
2006	18.3	906	16.3	165	2.6	0.01	404
2007	19	707	12.5	254	8.31	<0.001	939
2008 [b]	17.6	430	13.6				
2009	18.6	236	11.1	95	6.19	<0.001	329
2010	17.9	345	12.5	108	4.21	<0.001	238
2011	17.1	940	13.8	193	4.16	<0.001	457
2012	14.7	869	10	271	6.63	<0.001	1,036
2013	14.5	786	8.4	206	8.67	<0.001	958
2014	10.9	1,171	8.5	319	3.95	<0.001	1,488
2015	12.6	872	7.7	350	9.8	<0.001	1,218
2016	12.32	913	8.88	487	5.54	<0.001	1,383
2017	11.56	474	7.89	378	5.47	<0.001	812
2018	10.82	494	7.67	538	4.77	<0.001	741

[a] Satterhwaite approximate *t* used when variances were unequal.

[b] Cleaned at sea (CAS) mean weight based on double exponential projection of 1994–2007 data due to no CAS samples obtained after June in 2008.

Deep Creek and Anchor Point

The Central Cook Inlet fishery is primarily a halibut and salmon fishery, with any additional groundfish harvest consisting mostly of Pacific cod. The beaches near the mouths of Deep Creek and the Anchor River are the primary access areas and account for most of the halibut landings from the Central Cook Inlet fishery.

Because a single technician covers both of these access points, it is important to allocate sampling effort between Deep Creek and Anchor Point such that the resulting sample is representative of the size distribution and spatial distribution of the harvest in the Central Cook Inlet fishery. In the mid-1990s there were significant differences in the mean weights of harvested halibut between the 2 sites. Analyses of recent data (2010–2018) show there are differences in mean weight for charter anglers between sites in most years and a significant difference every year in the spatial distribution of halibut harvest for both charter and private anglers (Table 5).

Table 5.–Tests for differences in mean weight and spatial distribution of Pacific halibut harvest by charter and private anglers between the Deep Creek and Anchor Point sampling sites, 2010–2018.

		Charter			Private		
Test	Year	Test statistic	df	P value	Test statistic	df	P value
t test for differences in mean weight between Deep Cr. and Anchor Pt.	2010	−5.84	302	<0.01	1.5	105	0.14
	2011	−4.17	348	<0.01	−0.43	227	0.67
	2012	−4.27	164	<0.01	1.27	221	0.21
	2013	−3.26	74	<0.01	−0.12	203	0.91
	2014	0.95	175	0.34	1.47	184	0.14
	2015	−4.82	108	<0.01	0.12	164	0.91
	2016	–2.11	32	0.04	2.59	267	0.01
	2017	–2.64	136	<0.01	3.23	247	<0.01
	2018	–1.28	168	0.2	–1.28	252	0.2
Chi-square contingency test for differences in spatial distribution (proportion by statistical area) between Deep Cr. and Anchor Pt.	2010	103	5	<0.01	201	6	<0.01
	2011	360	10	<0.01	600	8	<0.01
	2012	450	7	<0.01	170	7	<0.01
	2013	94	8	<0.01	212	6	<0.01
	2014	496	9	<0.01	230	8	<0.01
	2015	29	5	<0.01	275	6	<0.01
	2016	515	5	<0.01	127	5	<0.01
	2017	240	7	<0.01	84	6	<0.01
	2018	149	6	<0.01	174	6	<0.01

The possibility of differences in either mean weight or spatial distribution of harvest makes it prudent to distribute interview effort and biological sampling between the 2 sites such that the resulting harvest reported in interviews and biological samples are proportional to harvest at the 2 sites. Determining the appropriate allocation of sampling effort is problematic for the following reasons: 1) estimates of neither the overall sport harvest (charter and private) nor the private harvest are available for Deep Creek and Anchor Point separately, 2) sampling efficiency differs by site, 3) sampling efficiency differs by technician, and 4) the distribution of harvest between sites is dynamic. In 2002 and 2003, staff observed that more of the Ninilchik-based charter operators that normally launch at Deep Creek were launching at Anchor Point to reduce running time on the water and to save fuel. In addition, the Deep Creek boat launch was washed out by floods in 2002, which reduced access particularly for unguided boats. The loss of the Deep Creek boat ramp and a decrease in the number of private boats launching off the beach south of the tractor launch allowed increased sampling on the tractor launch, increasing interview sampling efficiency at Deep Creek.

Because charter harvest data are available from guide logbooks for the 2 sites separately, allocation of sampling effort has been based on relative levels of reported charter harvest. It is assumed that sampling efficiency for the charter and private fisheries is similar, and that a sample that is representative of the charter harvest will represent the private harvest adequately. Charter harvest was reported in logbooks during the periods 1998–2001 and 2006–2018.

Logbook data for 2014 indicated 73% of the charter angler-days, 72% of charter rod-days, and 74% of the charter harvest (number of fish) was attributed to Deep Creek versus Anchor Point. By comparison, 78% of the halibut harvest reported in interviews and 77% of the biological

samples were from Deep Creek rather than Anchor Point. Since 2006, the proportion of the logbook charter harvest reported for Deep Creek averaged 72%, compared with 83% reported in interviews and 71% of the biological samples from Deep Creek. Based on this information, 70% of interview effort will be allocated to Deep Creek.

Between 1994 and 2004, the sampling design for this fishery was based on data from 1993 that showed that the majority of boats exited the fishery during the 6-hour period following high tide (S. C. Meyer, Assessment of recreational halibut and groundfish harvest in Southcentral Alaska, unpublished ADF&G operational plan FY1995). In the mid-1990s, many of the boats were launched off the beach or the boat ramps at high tide using personal vehicles. Since then, the boat ramp at Deep Creek has washed out and commercial tractor launching facilities have become well developed. Most charter and private boats now use the commercial tractor facilities and can launch on any tide stage. In 2005, the sampling schedule was changed based on information from charter operators and the tractor launch operator. The changes were made to intercept a greater proportion of returning vessels. The schedule now accounts for seasonal changes in the hours of operation of the tractor launches, the approximate 1.5-hour delay between the published tide times and actual slack tide in the center of Cook Inlet, and the changed pattern of use at Anchor Point.

The work shift at Anchor Point will be 1200–1800 hours, regardless of tide. Biological sampling and interviews at Deep Creek will still be structured around tides, but based on the following rules that correspond with hours of operation of the tractor launch; sampling will target high slack tide if it falls within 0330–1630 hours before 24 July, or within 0430–1630 hours from 24 July to 6 August, or within 0530–1630 hours after 6 August. If high slack tide does not meet these criteria, sampling will target low slack tide. If the tide is before 0630 hours, the shift will start at 1000 hours. If the tide is after 1430 hours, the shift starts at 1500 hours. For all other tides, if the tide is in the first half of the hour, the shift starts 2 hours after the hour of the tide. If the tide is in the last half of the hour, the shift starts 3 hours after the hour of the tide. All shifts are listed in Appendix A3.

Biological sampling will primarily be conducted at charter offices and private cleaning tables. The first portion of each shift will be spent on the beach sampling fish or finding out where private anglers or charter vessels will be transporting their fish for cleaning. Anglers usually leave the beach immediately to clean fish at charter facilities or other sites located away from the beach. Sampling harvest at the tractor-launch facilities is impractical because it detains boats and disrupts the flow of traffic. Sampling at the boat ramps also requires climbing aboard large boats on trailers, and fish are often in totes or holds and cannot be laid out for sampling. Most of the sampling, therefore, will be at charter cleaning facilities, RV parks, and campgrounds where fish are cleaned. Prior to sampling, the technician will determine whether all fish from the trip are available for sampling. If some of the harvest was cleaned at sea and those carcasses discarded, those fish will not be sampled.

Seward

Biological sampling will be conducted at the Seward harbor and at the Army recreation camp. Biological sampling shifts will start at 1500 hours but may be adjusted inseason to maximize sampling efficiency. The proportion of halibut cleaned at sea is low (Table 2), and when they are cleaned at sea, all or nearly all fish are cleaned (Table 3). Charter operators that regularly clean halibut at sea will be asked to retain carcasses for sampling. No portion of the daily harvest of a

species category (halibut, lingcod, rockfish, or sharks) will be sampled from any boat unless all fish or cleaned carcasses of that species are returned to port.

Technicians will disperse sampling effort between the public fish cleaning stations, boat ramps, and Army camp cleaning facilities such that data are drawn from throughout the day's landings. Emphasis will be placed on contacting and obtaining data from private vessels because of their lower success rates and generally smaller catches per boat-trip. Sampling will be alternated between cleaning sites throughout the shift to spread samples over time and to avoid selecting for early- or late-returning boats.

Angler interviews will utilize a design and schedule like that used in Homer. Interviews will be conducted in the Seward harbor during the period 1400–2100 hours. This period has proved adequate in past years. The harbor will be divided into 4 areas for 2019 (Figure 5). Interviews will be conducted for approximately 1 hour (minus travel time) in each area. The order in which areas are sampled is assigned randomly and shifted systematically to apportion sampling effort equally among areas (Appendix A4). The technicians will contact and obtain interviews from boats tying up or offloading in the assigned area (including the fuel station), unless previously interviewed.

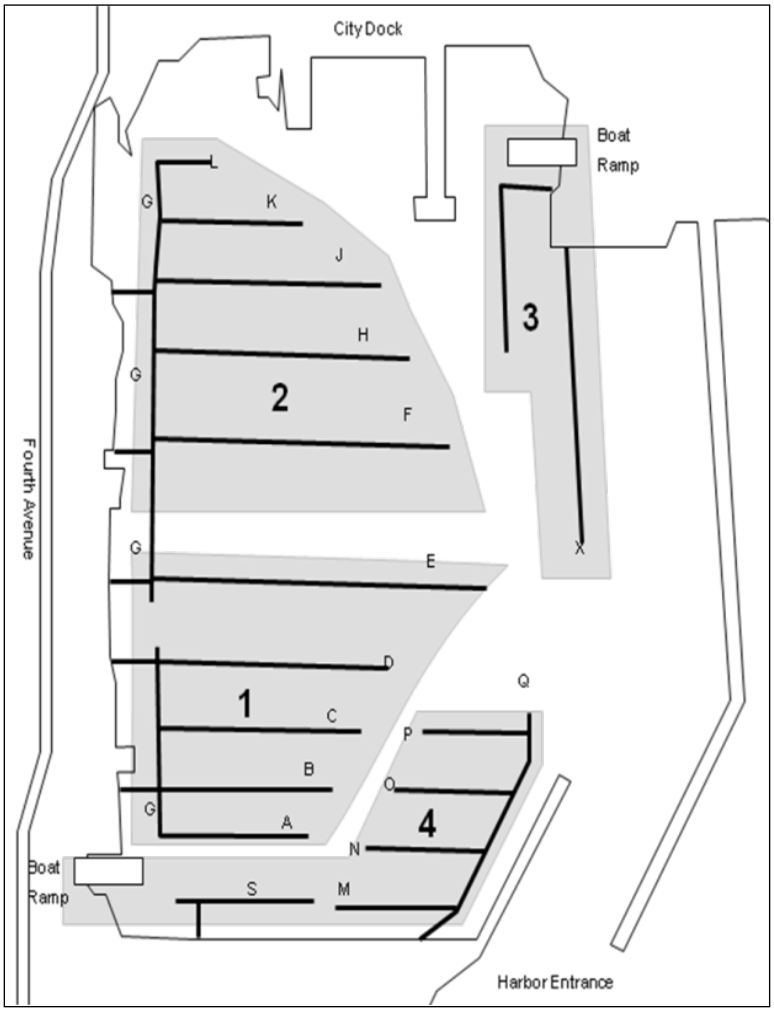

Figure 5.–Seward harbor interview areas used in 2019.

Whittier

All interview and biological sampling will take place in the Whittier harbor. Prior to 2009, biological sampling and interviews were conducted concurrently. Beginning in 2009, interviews and biological sampling were conducted on separate days. The city has obtained permits to conduct a geographic survey at the head of Passage Canal while the U.S. Army Corps of Engineers is studying the feasibility of establishing a new marina in that area. This fishery will continue to be monitored and the sampling design will be changed to accommodate sampling if construction of a tractor launch or new marina is completed.

Interviews and biological sampling will be conducted during the period 1500–2200 hours. Interviews will be conducted throughout the Whittier harbor on scheduled interview days (Appendix A5). The technician will attempt to interview all returning vessels during this period. During lingcod season, lingcod samples will be collected on both biological and interview days. To optimize the amount of data collected, the technician may have to focus on gathering interview data and store fish carcasses during this period. For example, carcass buckets may be assigned to specific vessels, or fish will be labeled with stat area and user group information for biological sampling later in the shift.

The proportion of halibut harvest that is cleaned (and carcasses disposed of) at sea by charter and private vessels is relatively high (Table 2), but when halibut are cleaned at sea, nearly all of the fish are processed at sea (Table 3). Data collected since 2011 indicate that rockfish and lingcod are also cleaned at sea in relatively high proportions. Many private boats go out on overnight or multiple-day trips and clean or eat their catch before returning to the harbor. Fish cleaning tables were installed in the harbor in 2002, but they are inadequate to handle the demand and there are sometimes long waits for tables. Beginning in 2006, seasonal technicians repeatedly noted that charter halibut sampling goals were easily obtained, but that it was more difficult to attain the desired sample size for the private fleet and for other species. Various technicians also noted success in getting charter operators to retain rockfish and lingcod carcasses for sampling, but this is rarely possible with private anglers. In order to address the potential bias associated with not sampling fish cleaned at sea, ADF&G will be issuing a News Release (NR) for the 2019 season requesting the retention of groundfish carcasses.

Valdez

All interview and biological sampling will take place in the Valdez harbor because this is virtually the only access point. Biological sampling at Valdez will be conducted primarily during the period 1500–2200 hours. Fish will be sampled by moving among the fish cleaning stations to spread samples over time and to avoid selecting for early- or late-returning boats.

Only about 1% of charter-caught halibut and 4% of private-caught halibut were cleaned at sea in 2018 (Table 2). Therefore, no specific program will be implemented to collect data from halibut cleaned at sea. The technician, however, will solicit cooperation with charter operators and private anglers to return fish carcasses.

Interviews will be conducted throughout the Valdez harbor during the period 1500–2200 hours on scheduled interview days (Appendix A6). The technician will attempt to interview all returning vessels during this period.

Sample Sizes

A bootstrap variance estimator is used by this project to estimate variances around the means for each objective (see Data Analysis section). Prior to 2011, sample size goals were established under multinomial sampling assumptions. However, when these assumptions are not met, the resulting standard errors can be 2 or more times greater than standard errors estimated under multinomial sampling assumptions.

Unfortunately, with the bootstrap variance estimator, it is not possible to predict exactly what sample sizes are necessary to meet the precision objectives, as was done with multinomial variance estimators. However, since staffing levels are constant and samplers are completely occupied during most of the season, sample sizes are likely to be similar to past years and we expect that the precision objectives will continue to be met.

Some of the data collected during this project contain substantial variation among boats sampled on the same day. Thus, there is potential for bias if boats are selected for sampling in a nonrepresentative manner. For this reason, it is desirable to minimize subjectivity in boat sample selection as much as possible. Because one potential source of subjectivity is the incentive to meet sample size goals (boats with higher catches being more desirable), such goals will receive less emphasis. Instead, we will use sample sizes from previous years as a gauge for what can be attained by port (Table 6). The average sample sizes are based on the past 3 seasons for which we have a full complement of data (2015, 2016, and 2018). Sample sizes in Table 6 are not intended as goals, but rather as a preseason reference for what to expect. For example, if the value in Table 6 is exceeded before the end of the season, sampling will *not* be discontinued. The primary consideration with respect to sample selection should be to obtain a representative sample, rather than to achieve a sample size target.

Table 6.–Average sample sizes by port for biological sampling, 2015, 2016, and 2018.

		Average sample size		
Port	User group	Halibut	Rockfish	Lingcod
Kodiak				
	Charter	150	311	25
	Private	257	362	37
	Total	407	673	62
Deep Cr.–Anchor Pt.				
	Charter	560	34	2
	Private	398	–	–
	Total	958	34	2
Homer				
	Charter	–	483	58
	(Cleaned at sea)	433	–	–
	(Cleaned in port)	779	–	–
	Private	909	205	15
	Total	2,121	688	73
Seward				
	Charter	1014	1,267	83
	Private	335	465	23
	Total	1,349	1,732	106

-continued-

Table 6.–Page 2 of 2.

Port	User group	Average sample size		
		Halibut	Rockfish	Lingcod
Whittier				
	Charter	264	480	83
	Private	183	144	13
	Total	447	624	96
Valdez				
	Charter	466	587	164
	Private	291	255	22
	Total	757	842	186

DATA COLLECTION

Biological Sampling

Fish landed by sport fishing anglers are usually filleted with viscera and skin intact but may also be whole or gutted and bled. Rockfish will be identified to species in the field using Kramer and O'Connell (1995) or Orr et al. (1998). Difficult fish may be keyed out using Mecklenburg et al. (2002). The user group (charter or private) and unique identifier for each vessel (vessel name for charters, unique alpha-numeric code p1, p2, etc. by vessel for private vessels) and ADF&G groundfish statistical area of capture will be recorded for all fish when known. Sex of all bony fish will be determined by examination of gonads. Sex of sharks will be determined by external appearance of the urogenital area (Castro 1983; Appendix B1). Lengths will be measured as outlined in Table 7.

Only rockfish and lingcod will be weighed. Rockfish will be weighed using brass spring scales (12.5 × 0.1 kg, checked for accuracy and calibrated pre- and midseason) and weights will be recorded to the nearest 0.1 kg. Lingcod will be weighed using aluminum spring scales (35 × 0.5 kg) with weights recorded to the nearest 0.5 kg. All biological data will be recorded in the field on prestamped coin envelopes or on waterproof data sheets inserted into sealable plastic bags (sharks). Data will be entered by technicians into Excel templates.

Table 7.–Type and precision of length measurements by species.

Species	Measurement(s)	Precision
Halibut	Tip of the snout to the central lobe of the caudal fin	Nearest cm
Lingcod	Maximum total length (Anderson and Gutreuter 1983)	Nearest cm
All rockfishes	Maximum total length (Anderson and Gutreuter 1983)	Nearest cm
Salmon shark	(1) Total length, (2) fork length, and (3) pre-caudal length	Nearest cm
Pacific sleeper shark	Total length	Nearest cm
Spiny dogfish	Total length	Nearest cm

A variety of structures, depending on the species, will be collected and used to determine age. The left (ventral) otolith (saggitus) will be removed from halibut. Both otoliths will be removed from all rockfish. Halibut and rockfish otoliths will be hand-cleaned in water and stored in the labeled coin envelopes recorded with associated biological data. The 4th–8th rays of the posterior lobe of the dorsal fin of lingcod will be removed and stored flat in labeled, weatherproof paper envelopes. Each day's collection of lingcod fins will then be frozen in individual sealable plastic bags to minimize dehydration. Additionally, lingcod otoliths will be

collected from every third lingcod sampled in order to assess the suitability of lingcod otoliths for aging. A 15–20 cm section of the vertebrae will be removed from the gill area of salmon sharks and placed into a locking plastic bag with its associated data sheet. At the end of the day, it will be frozen for later age estimation (Appendix B1). The posterior dorsal fin spine will be removed from spiny dogfish and stored in a labeled coin envelope.

The subsistence fishery for halibut began in May 2003. Subsistence fishing for halibut is allowed in all federal waters and all state waters that are outside of nonsubsistence areas. Technicians may encounter subsistence-caught halibut and other bottomfish taken as bycatch in the subsistence fishery. Technicians will determine whether the halibut or other species were harvested by subsistence or sport fishing. No halibut, rockfish, lingcod, or sharks caught by subsistence users will be sampled or recorded in this project.

Because this project covers a wide area, project personnel are in a unique position to assist other agencies and ADF&G research projects. In addition to data required for this project staff may also collect tissue samples for ADF&G projects, collect samples for other agencies and institutions, and distribute deep water release devices to anglers.

Angler Interviews

Technicians will attempt to contact all boats returning to the harbor or assigned area. Because of the seasonal preponderance of salmon sport fishing and subsistence fishing, the initial step in each contact will be to determine whether the vessel was sport fishing and whether anglers targeted or caught any halibut, rockfish, lingcod, or sharks (Appendix C1). Vessel-parties that were sport fishing and targeted these species or caught them while targeting other species will be interviewed, regardless of fishing success.

Once it is established that a vessel is eligible for and consents to an interview, the following information will be recorded for each boat-trip (Appendix C2)**:**

1) date and time
2) boat name (if charter trip)
3) logbook number (if charter trip, dummy logbook number if private trip)
4) whether trip is first or second trip of the day
5) duration of trip in days
6) user group (e.g., charter, private)
7) target species category
8) primary ADF&G groundfish statistical area(s) fished (or accounts for majority of harvest)
9) specific location of the interview (harbor or harbor area)
10) whether anglers fished inside Resurrection Bay, outside the bay, or both (Seward only)
11) number of angler-days of effort for entire trip (recorded separately as client and crew days)
12) number of hours fished by persons on board from the start of fishing at the first spot to the end of fishing activity at the last spot, including time spent searching for fish or moving between spots
13) number of halibut kept, and the number of those that were cleaned at sea
14) whether halibut harvest was counted (verified) or not
15) numbers of halibut released that were caught on circle hooks and on all other hook types
16) numbers of pelagic, yelloweye, and other nonpelagic rockfish kept, released, and cleaned at sea

17) whether pelagic, yelloweye, and other nonpelagic rockfish harvest was counted (verified) or not
18) the most common depth of capture (in feet) for pelagic, nonpelagic and yelloweye rockfish that were released
19) numbers of pelagic, yelloweye, and other nonpelagic rockfish released, by release method (whether at the surface, using a venting for fizzing tool, or with a deep-water release mechanism)
20) numbers of lingcod kept and cleaned at sea
21) number of lingcod released that were under 35 inches in length and number released 35 inches or greater in length
22) whether lingcod harvest was counted (verified) or not
23) numbers of Pacific cod (*Gadus macrocephalus*) kept and released, cleaned at sea, and whether harvest was counted (verified) or not
24) numbers of sablefish (*Anoplopoma fimbria*) kept and released, cleaned at sea, and whether harvest was counted (verified) or not
25) numbers of pollock kept and released, cleaned at sea, and whether harvest was counted (verified) or not
26) numbers of sharks kept and released (by species), cleaned at sea, and whether harvest was counted (verified) or not

Charter boat skippers, rather than crew or clients, will be interviewed to obtain accurate reporting of statistical areas and species. Whenever possible, technicians will observe and count all harvested halibut, rockfish, lingcod, and sharks and record the appropriate variables to indicate that these fish were counted. They will also have to check to ensure that the fish they are counting represent the entire harvest for that trip (i.e., no fish have been filleted or stored elsewhere on vessel). Some common situations that would preclude counting the actual harvested fish include the following: 1) some of the fish were filleted and the carcasses tossed at sea, 2) some of the fish were consumed at sea, 3) some of the fish were already offloaded and carried away, 4) returning boat traffic was extremely heavy and the technician needed to conduct other interviews, or 5) taking the time to count fish would interfere with other boat launching operations and cause congestion at the boat launch or beach.

Interview data will be recorded on Allegro CX[1] field computers using DataPlus Professional data capture software, as outlined in Appendix C2. The DataPlus software contains numerous data validation routines that should catch most errors at the point of data entry. Port samplers will create a new data file each interview day and back it up to a desktop computer at the end of each shift.

DATA REDUCTION

Halibut otoliths will be stored dry in individually labeled coin envelopes and sent to the IPHC for age analysis annually. Rockfish otoliths will be read using transverse burned or baked sections and reflected light (MacLellan 1997). Lingcod fin rays will be dried, cross-sectioned, mounted on labeled microscope slides, and read under transmitted light (Beamish and Chilton 1977). Prior to recording ages, reference sets from previous years will be read until a high proportion of assigned ages agree and differences are unbiased and independent of age (Appendix D1). These

[1] Product names used in this publication are for completeness and do not constitute product endorsement.

performance standards, in place verbally since the beginning of the program, were documented in an age-reader performance standards memo distributed to staff early in 2009 (Appendix D1). Salmon shark vertebrae will be frozen upon collection, then cleaned, soaked in alcohol, sectioned, and mounted on glass slides following procedures described by Goldman (2005). A subsample (random 20%) of rockfish, lingcod, and salmon shark age structures will be read twice to assess within-reader error over time. Otoliths and fin rays will be archived at ADF&G in Homer.

Interview data files and Excel workbooks containing biological data will be e-mailed to the field supervisor and crew leader weekly for error checking and compilation of sampling summaries. At the end of the season, all files will be converted to SAS datasets for analysis and ASCII files for archival. The file structure of ASCII files will be documented. All files will be named using conventions established by ADF&G Division of Sport Fish (SF) Research and Technical Services (RTS).

All sample envelopes will be hand checked against excel datasheets for errors. Initial editing of biological data files will include checks of frequency listings for impossible or unlikely (insidious) data and will ensure correspondence with collected age structures (e.g., there should be a coin envelope containing data and an age structure for each record). After aging is complete and age data are entered, data files will be checked using a program developed to spot insidious data entry errors and outliers not detectable with frequency listings. The program includes checks of data against length-weight and length-age relationships and outputs a list of suspect records that will then be compared to the original data (coin envelopes). Troubleshooting of errors will also involve established relationships between fish length and otolith length or weight for selected species.

Interview files will also be checked with a program that finds insidious data entry errors and outliers not detectable with simple range checks or frequency listings. Hopefully, most of these errors will be identified and corrected at the time of data entry.

Copies of edited biological and interview files will be stored on the Homer LAN server, project leader's computer, and backed up on an external hard drive. Historical archived files and original files can be found in the same locations.

DATA ANALYSIS

Halibut Mean Weight (Primary Objective 1)

Most sampled halibut are filleted or gutted. Because most fish cannot be weighed, the IPHC length-weight relationship is employed to estimate the mean net weight of all measured halibut. Mean net weight will be estimated for each user group g in each subarea a as the mean of the predicted weights over all n_{ga} sampled fish (Nielsen and Schoch 1980):

$$\overline{w}_{ga} = \frac{\sum_{k=1}^{n_{ga}} \alpha L_{gak}^{\beta}}{n_{ga}} \quad (1)$$

where

L_{gak} = the observed length of fish k (to the nearest centimeter),

α = 6.921×10^{-6} for net weight in pounds, and

β = 3.24 (Clark 1992).

These parameters were estimated from a log-log regression of length and weight data from a sample size of 5,184 halibut taken between British Columbia and the eastern Aleutians. No correction will be made for log transformation bias because the length-weight relationship was based on a large sample and the residual variance is extremely small (William Clark, IPHC, personal communication). Mean weight estimates are presented in pounds rather than kilograms because that is the standard unit used by halibut management agencies.

Variances of the mean predicted weights will be estimated through a bootstrap procedure[2]. A 2-stage bootstrap will be conducted for each port, where the first stage is the sampling date, and the second stage is the vessel. The bootstrap routine resamples days within a year, and boat trips within a day. All sampling is conducted "with replacement," and the number of resampled data points is equal to the original sample size. Mean weight is calculated across all resampled fish, and the process is repeated 500 times. The standard deviation of the 500 bootstrap values of mean weight is the standard error[3] for the mean weight estimate in Equation 2.

Homer

Charter halibut data from Homer will be designated "cleaned in port" or "cleaned at sea." There was a significant difference in the mean net weight of charter-harvested halibut cleaned at sea versus cleaned in port for the past several years (Table 4). Therefore, we will continue to separate these groups during data collection. The mean weight and variance of the mean weight for the charter sector ($\hat{\overline{w}}_C$) will be estimated as follows:

$$\hat{\overline{w}}_C = (\overline{w}_{CS}\,\hat{p}_{CS}) + (\overline{w}_{CP}\,\hat{p}_{CP}), \tag{2a}$$

$$= (\overline{w}_{CS}\,\hat{p}_{CS}) + (\overline{w}_{CP}(1-\hat{p}_{CS})) \tag{2b}$$

$$= (\overline{w}_{CS}\,\hat{p}_{CS}) + \overline{w}_{CP} - (\overline{w}_{CP}\hat{p}_{CS}) \tag{2c}$$

where

$\overline{w}_{CS}$ = the sample mean weight of charter-caught fish cleaned at sea,

$\hat{p}_{CS}$ = the estimated proportion of charter-caught fish cleaned at sea,

$\overline{w}_{CP}$ = the sample mean weight of charter-caught fish cleaned in port, and

$\hat{p}_{CP}$ = the estimated proportion of charter-caught fish cleaned in port.

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[2] Methodology used to estimate variances of the mean predicted weights may continue to evolve. Closed-form variance estimates for multistage designs are currently being developed for similar programs in southeast Alaska.

[3] Standard errors produced from this method are approximate and could have a high or low bias. For instance, the sampling schedule has a systematic (weekly) periodicity, yet the resampling algorithm assumes independent selection of dates within a year, which would tend to over-estimate the standard error. On the other hand, on some occasions only a single boat is sampled per day, leading the 2-stage resampling procedure to miss the second-stage component of variance entirely and under-estimate the standard error.

The proportion $\hat{p}_{CS}$ (Secondary Objective 1) and its variance is estimated using completed-trip interview data:

$$\hat{p}_{CS} = \frac{n_{CS}}{n} \text{ and} \tag{3}$$

$$v(\hat{p}_{CS}) = \frac{\hat{p}_{CS}(1-\hat{p}_{CS})}{n-1} \tag{4}$$

where n_{CS} is the number of halibut cleaned at sea on interviewed charter vessels, and n is the number of halibut kept by interviewed charter vessels. The variance of the mean weight for charter-caught halibut will be estimated as follows (Goodman 1960):

$$v(\hat{\bar{w}}_C) = v(\bar{w}_{CS}\hat{p}_{CS}) + v(\bar{w}_{CP}) + v(\bar{w}_{CP}\hat{p}_{CS}) - 2Cov(\bar{w}_{CS}\hat{p}_{CS}, \bar{w}_{CP}\hat{p}_{CS}) - 2Cov(\bar{w}_{CP}, \bar{w}_{CP}\hat{p}_{CS}) \tag{5}$$

where

$$v(\bar{w}_{CS}\hat{p}_{CS}) = \left[\bar{w}_{CS}^2 v(\hat{p}_{CS}) + v(\bar{w}_{CS})\hat{p}_{CS}^2 - v(\bar{w}_{CS})v(\hat{p}_{CS})\right], \tag{6}$$

$$v(\bar{w}_{CP}\hat{p}_{CS}) = \left[\bar{w}_{CP}^2 v(\hat{p}_{CS}) + v(\bar{w}_{CP})\hat{p}_{CS}^2 - v(\bar{w}_{CP})v(\hat{p}_{CS})\right], \tag{7}$$

$$Cov(\bar{w}_{CS}\hat{p}_{CS}, \bar{w}_{CP}\hat{p}_{CS}) = \bar{w}_{CS}\,\bar{w}_{CP}v(\hat{p}_{CS}) \text{ and} \tag{8}$$

$$Cov(\bar{w}_{CP}, \bar{w}_{CP}\hat{p}_{CS}) = \hat{p}_{CS}\hat{v}(\bar{w}_{CP}) \tag{9}$$

and where $v(\bar{w}_{CS})$ and $v(\bar{w}_{CP})$ are obtained through the 2-stage bootstrap described above.

Whittier and Valdez

Waters fished by the Whittier and Valdez halibut fleets overlap spatially, especially in the charter boat fishery. There are substantial differences in the harvest characteristics between these ports, however. The Statewide Harvest Survey (SWHS) now provides harvest estimates for trips ending in Whittier or western Prince William Sound (PWS), Valdez, or Cordova or eastern PWS. The SWHS estimates for Whittier and western PWS will be applied to the mean weight estimates from Whittier to estimate harvest biomass. Because there is no port sampling in Cordova, SWHS harvest estimates for eastern PWS will be applied to the mean weight estimated from Valdez data to estimate harvest biomass for eastern PWS.

Age, Length, and Sex Composition (Primary Objectives 2, 4, and 5)

Estimates of age, length, and sex composition will be expressed as $\hat{p}_i$, the proportion of the harvest in each group *i*, where the group variable is age, length, or sex (Thompson 1992: page 36). Estimates will be stratified by user group to minimize bias.

Age composition will be estimated as follows:

$$\hat{p}_{ij} = \frac{\hat{H}_{ij}}{\hat{H}_i} \tag{10}$$

where

$\hat{H}_{ij}$ = the estimated number of age *j* fish in the harvest of species *i*, and

$\widehat{H}_i$ = the estimated number of species *i* fish harvested (data from SWHS).

The number of age *j* fish in the harvest of species *i* will be estimated as

$$\widehat{H}_{ij} = \hat{p}_{ijG}\widehat{H}_{iG} + \hat{p}_{ijU}\widehat{H}_{iU} \tag{11}$$

where

$\hat{p}_{ijG}$ = the observed proportion of age *j* in the guided (charter) harvest of species *i*,

$\hat{p}_{ijU}$ = the observed proportion of age *j* in the unguided harvest of species *i*,

$\widehat{H}_{iG}$ = the estimated harvest of species *i* by guided anglers (from SWHS), and

$\widehat{H}_{iU}$ = the estimated harvest of species *i* by unguided anglers (from SWHS).

The variance of $\hat{p}_{ij}$ will then be estimated using the multivariate delta method and assuming $[Cov(\widehat{H}_{iG}, \widehat{H}_{iU}) = 0]$ as

$$\hat{v}(\hat{p}_{ij}) = \frac{1}{\widehat{H}_i^2}\left[\frac{\hat{v}(\widehat{H}_{iG})\left(\hat{p}_{ijG}\widehat{H}_{iU} - \widehat{H}_{ijU}\right)^2}{\widehat{H}_i^2} + \frac{\hat{v}(\widehat{H}_{iU})\left(\hat{p}_{ijU}\widehat{H}_{iG} - \widehat{H}_{ijG}\right)^2}{\widehat{H}_i^2} + \hat{v}(\hat{p}_{ijG})\widehat{H}_{iG}^2 + \hat{v}(\hat{p}_{ijU})\widehat{H}_{iU}^2\right] \tag{12}$$

where

$$\widehat{H}_{iG} = \hat{p}_{iG}\widehat{H}_G, \tag{13}$$

$$\hat{v}(\widehat{H}_{iG}) = \hat{p}_{iG}^2\,\hat{v}(\widehat{H}_G) + \hat{v}(\hat{p}_{iG})\widehat{H}_G^2 - \hat{v}(\hat{p}_{iG})\hat{v}(\widehat{H}_G), \tag{14}$$

$$\widehat{H}_{iU} = \hat{p}_{iU}\widehat{H}_U, \tag{15}$$

$$\hat{v}(\widehat{H}_{iU}) = \hat{p}_{iU}^2 v(\widehat{H}_U) + \hat{v}(\hat{p}_{iU})\widehat{H}_U^2 - v(\hat{p}_{iU})v(\hat{p}_{iU}), \text{ and} \tag{16}$$

$$\widehat{H}_i = \widehat{H}_{iG} + \widehat{H}_{iU}. \tag{17}$$

Length and sex composition will be estimated using Equations 10–17, substituting length or sex for age.

As mentioned earlier, this project employs a 2-stage sampling design with random sampling of days of the week at the first stage and cluster sampling of the catch from nonrandomly selected vessels at the second stage. Sampling is designed to minimize bias in the point estimates, but variances of all estimates of species, age, length, and sex composition are likely underestimated because the variance formulas are based on simple random sampling.

If necessary, halibut length composition estimates for Homer may be stratified by 3 user groups: 1) private harvest, 2) charter harvest cleaned in port, and 3) charter harvest cleaned at sea. The stratified estimator in this case is

$$\hat{p}_{i_{ST}} = \hat{h}_p\hat{p}_{i(p)} + \hat{h}_c\left[\hat{h}_{port}\hat{p}_{i(port)} + \hat{h}_{sea}\hat{p}_{i(sea)}\right] \tag{18}$$

where

$\hat{h}_p$ = the estimated proportion of the total subarea harvest taken by private anglers,

$\hat{p}_{i(p)}$ = the estimated proportion of private-caught halibut in length group *i*,

$\hat{h}_c$ = the estimated proportion of the total subarea harvest taken by charter anglers,

$\hat{h}_{port}$ = the estimated proportion of charter-caught halibut that were cleaned in port,

$\hat{h}_{sea}$ = the estimated proportion of charter-caught halibut that were cleaned at sea.

$\hat{p}_{i(port)}$ = the estimated proportion of charter-caught halibut cleaned in port in length group *i*, and

$\hat{p}_{i(sea)}$ = the estimated proportion of charter-caught halibut cleaned at sea in length group *i*.

The stratum weights are based on large sample sizes and are therefore considered constants. Variances of the proportions will be estimated by

$$\begin{aligned} v\left[\hat{p}_{i_{ST}}\right] &= h_p^2 v\left[\hat{p}_{i(p)}\right] + h_c^2 \left\{v\left[\hat{h}_{port}\hat{p}_{i(port)} + \hat{h}_{sea}\hat{p}_{i(sea)}\right]\right\} \\ &= h_p^2 v\left[\hat{p}_{i(p)}\right] + h_c^2 \left\{v\left[\hat{h}_{port}\hat{p}_{i(port)}\right] + v\left[\hat{h}_{sea}\hat{p}_{i(sea)}\right]\right\} \end{aligned} \tag{19}$$

where

$$v\left[\hat{h}_{port}\hat{p}_{i(port)}\right] = v\left[\hat{h}_{port}\right]\hat{p}_{i(port)}^2 + \hat{h}_{port}^2 v\left[\hat{p}_{i(port)}\right] - v\left[\hat{h}_{port}\right]v\left[\hat{p}_{i(port)}\right] \text{and} \tag{20}$$

$$v\left[\hat{h}_{sea}\hat{p}_{i(sea)}\right] = v\left[\hat{h}_{sea}\right]\hat{p}_{i(sea)}^2 + h_{sea}^2 v\left[\hat{p}_{i(sea)}\right] - v\left[\hat{h}_{sea}\right]v\left[\hat{p}_{i(sea)}\right] \tag{21}$$

The variables $\hat{h}_{sea}$ and $\hat{h}_{port}$ will be estimated from angler interviews. For example,

$$\hat{h}_{sea} = \frac{n_{sea}}{n} \tag{21}$$

where

n_{sea} = the number of halibut cleaned at sea on charter boats contacted for interviews, and

n = the total number of halibut kept by interviewed anglers.

The variances of $\hat{h}_{sea}$ and $\hat{h}_{port}$ will be obtained through the 2-stage bootstrap described above.

Rockfish Species Composition (Primary Objective 3)

There is potential for bias in the estimation of any summary statistic if the statistic varies by user group and sample size is not proportional to harvest by each user group. To avoid this potential bias, estimates of species composition are stratified by user group (guided versus unguided). The proportion of harvest consisting of species *i* will be estimated as follows:

$$\hat{p}_i = \frac{\hat{H}_i}{\hat{H}} \tag{22}$$

where

$\widehat{H}_i$ = the estimated number of rockfish of species *i* harvested, and

$\widehat{H}$ = the estimated number of rockfish (all species) harvested (data from SWHS).

The harvest of species *i* (in number of fish) will be estimated as

$$\widehat{H}_i = \hat{p}_{iG}\widehat{H}_G + \hat{p}_{iU}\widehat{H}_U \tag{23}$$

where

$\hat{p}_{iG}$ = the observed proportion of species *i* in the guided harvest, or n_{iG}/n_G,

$\hat{p}_{iU}$ = the observed proportion of species *i* in the unguided harvest, or n_{iU}/n_U,

$\widehat{H}_G$ = the estimated rockfish harvest by guided anglers (from SWHS), and

$\widehat{H}_U$ = the estimated rockfish harvest by unguided anglers (from SWHS).

The variance of $\hat{p}_i$ will be estimated using the multivariate delta method and assuming $[Cov(\widehat{H}_G, \widehat{H}_U) = 0]$ as

$$\hat{v}(\hat{p}_i) = \frac{1}{\widehat{H}^2}\left[\frac{\hat{v}(\widehat{H}_G)\left(\hat{p}_{iG}\widehat{H}_U - \widehat{H}_{iU}\right)^2}{\widehat{H}^2} + \frac{\hat{v}(\widehat{H}_U)\left(\hat{p}_{iU}\widehat{H}_G - \widehat{H}_{iG}\right)^2}{\widehat{H}^2} + \hat{v}(\hat{p}_{iG})\widehat{H}_G^2 + \hat{v}(\hat{p}_{iU})\widehat{H}_U^2\right] \tag{24}$$

where

$$\hat{v}(\hat{p}_{iG}) = \hat{p}_{iG}(1 - \hat{p}_{iG})/(n_G - 1), \text{ and} \tag{25}$$

$$\hat{v}(\hat{p}_{iU}) = \hat{p}_{iU}(1 - \hat{p}_{iU})/(n_U - 1). \tag{26}$$

Estimated variances for the guided and unguided rockfish harvest are provided by ADF&G Research and Technical Services (RTS) (unpublished).

Spatial Distribution of Effort and Harvest (Primary Objective 6)

The proportions and variances of bottomfish fishing effort (in angler-days) and harvest by species (in numbers of fish, by species or species group) in each ADF&G groundfish statistical (stat) area *a* will be estimated separately for each user group *j* using data from vessel-trip interviews:

$$\hat{p}_{aj} = n_{aj}/n_j \text{ and} \tag{27}$$

$$\hat{v}(\hat{p}_{aj}) = \hat{p}_{aj}(1 - \hat{p}_{aj})/(n_j - 1) \tag{28}$$

where

n_{aj} = the reported bottomfish fishing effort (angler-days) or bottomfish harvest (by species or species group) from stat area a by user group j, and

n_j = the total reported effort or harvest by user group j.

Defining effort by species (e.g., lingcod) or species group (e.g., rockfish) can be problematic because anglers often target a variety of species during the day. For example, anglers will very rarely report rockfish as the sole target species of their trip. More often, anglers that harvested rockfish reported that they were fishing for halibut, bottomfish, or a combination of species. Depending on the terminal gear and locations fished, effort targeted on one species (including salmon) can also be effective for another. Effort for a given species will therefore be expressed as the number of angler-days spent targeting that species or a category that includes that species for any portion of a day. For example, halibut effort includes all effort for which the target category was "halibut," "bottomfish," or "bottomfish and salmon." Harvest distributions will be calculated using the number of fish for a particular species taken while targeting any species. When a trip covers more than 1 statistical area, effort and harvest will be broken out by area if possible. Otherwise, the primary stat area that was fished will be recorded. In effort calculations, an angler-day will be tallied for each area in which an angler spends any portion of the day fishing. Harvest from multiple statistical areas that are not separable will be apportioned to stat areas based on the distribution of harvest that was separable.

Estimates of the spatial distribution of effort and harvest apply only to the fleets returning to the sampled ports, not to particular waters or areas. For example, the spatial distributions of harvest and effort will be estimated for the guided (charter) and unguided fleets based in Kodiak city, not for the entire Kodiak area. Similarly, the distribution of harvest and effort will not be estimated for all fishing in PWS, but rather estimated separately for fleets fishing out of Seward, Whittier, and Valdez. As a result, there may be overlap in the spatial distribution of effort or harvest associated with multiple ports.

SCHEDULE AND DELIVERABLES

Dates	Activity
10 May–early June	Begin data collection at ports.
14 September	Data collection completed at all ports. Begin data reduction, data validation, and age determination.
October	Analysis and preliminary estimates of halibut mean weight and harvest biomass. Memo to the International Pacific Halibut Commission.
As needed	Preliminary data summaries to the North Pacific Fishery Management Council, Alaska Board of Fisheries, other agencies, and public.
Fall–winter	Analysis and report preparation for previous years' data.

Preliminary estimates of halibut harvest will be reported to the IPHC in October annually, and final estimates will be reported in an ADF&G, Division of Sport Fish Special Publication following publication of the statewide harvest survey estimates. Halibut data summaries will be provided to the NPFMC as needed for analyses of management alternatives, and to National Marine Fisheries Service (NMFS) regulators, the Alaska Board of Fisheries, Fish and Game

Advisory Committees, or individuals as requested. The 2019 season data will be presented when the SWHS estimates become available in 2020. Interim estimates will also be incorporated in Fishery Management Reports and may be presented to the Alaska Board of Fisheries pending action on regulatory proposals.

RESPONSIBILITIES

Martin Schuster, Fisheries Biologist II, Project Supervisor
Duties: Oversees all aspects of the project. Formulates research objectives to meet regional management goals, writes operational plan, oversees budgets, supervises all staff, analyzes results, and writes research reports and Federal Aid Progress Reports, summarizes research for other agencies, attends Alaska Board of Fisheries meetings, NPFMC meetings, and IPHC annual meetings, formulates and comments on regulatory proposals, and provides information to the public. Submits invoices and manages budget, prepares budget requests, analyzes data, and writes research reports.

Marian Ford, Fisheries Biologist I, Project Leader
Duties: Supervises day-to-day aspects of project, including hiring, training, and monitoring technicians. Supervises age readers and designs and analyzes tests of age reader precision. Ensures quality of field data, purchases and distributes sampling equipment, collects weekly sampling reports, and writes weekly fishing updates. Provides information to the public. Assists with formulating research objectives, writing operational plans, summarizing research for other agencies, and formulating comments on regulatory proposals.

Fish and Wildlife Technicians (6)
Duties: Collect biological and fishery data following procedures outlined in the operational plan and other instructions, complete data forms in an accurate and timely manner, identify sampling needs and problems, provide fishery information to the regional office for weekly fishing reports, explain the sampling program to the general public, maintain state vehicles and other equipment in good working order, and submit all necessary paperwork in a neat and timely manner. Some technicians will be responsible for enforcing sport fishing regulations, computer data entry, simple statistical analyses, or preparation and reading of age structures.

Sarah Webster, Fishery Biologist IV
Duties: Assists project supervisor with sample design, formulation of operational plan, data analysis, and editing of annual data reports. Compiles statewide halibut harvest estimates and projections. Presents ADF&G research at IPHC annual meeting and NPFMC meetings dealing with halibut and groundfish issues, and coordinates data collection and sharing with other federal and state agencies.

Adam Reimer, Biometrician II
Duties: Technically reviews study design, sampling methods, and data analysis of operational plan, and reviews report. Provides assistance in drafting operational plan and technical assistance inseason should changes in the design be necessary.

BUDGET SUMMARY

Line item budget for final FY 20 request for 11220029–11220029. Note that salaries are also contained in the FY 20 request for 11220000–11222821.

Line item	Category	Budget ($K)
100	Personal Services	143.59
200	Travel	4.54
300	Contractual	11.84
400	Commodities	0.75
500	Equipment	0.0
Total		160.72

Detailed Line 100: Personnel for final FY 20 request for 11220000–11220029.

Name (Location)	PCN	Title	Months	OT hours	Swing hours	Total ($K) (incl. benefits)
Ford (Homer)	4089	FB I	2.5	23	150	19.65
Litwiniak (Seward)	4157	FWT III	3.25	15	575	25.01
Unknown (CCI)	4124	FWT III	4	7.5	165	22.57
Foote (Homer)	4154	FWT III	3.75	15	400	22.48
Unknown (Kodiak)	4142	FWT II	3.25	15	575	19.51
Fisher (Valdez)	4122	FWT II	3.5	15	575	19.17
Unknown (Whittier)	5328	FWT II	2.75	15	575	15.2
Total			23			143.59

Detailed Line 200: Travel for final FY 20 request for 11220029–11220029.

Item	Cost
Field Travel	4.54

Detailed Line 300: Contractual for final FY 20 request for 11220029–11220029.

Item	Cost ($K)
Phones	0.4
Print / Copy	0.2
Training (CPR / First Aid)	0.36
Transportation	0.63
Rents and leases	10.23
Total	11.84

Detailed Line 400: Commodities for final FY 20 request for 11220029–11220029.

Item	Cost ($K)
Operating supplies	0.75

Line item budget for final FY 20 request for 11220000–11222821. Note that salaries are also contained in the FY 20 request for 11220000–11220029.

Line item	Category	Budget ($K)
100	Personal Services	202.13
200	Travel	6.73
300	Contractual	1.28
400	Commodities	2.83
500	Equipment	0.0
Total		212.97

Detailed Line 100: Personnel for final FY 20 request for 11220000–11222821.

Name (Location)	PCN	Title	Months	OT hours	Swing hours	Total ($K) (incl. benefits)
Schuster (Homer)	4289	FB II	12			99
Ford (Homer)	4089	FB I	8.5	23	150	66.81
Litwiniak (Seward)	4157	FWT III	0.5	15	575	6.41
Foote (Homer)	4154	FWT III	0.5	15	400	5.85
Dubbe (Homer)	4171	FWT III	3.5	0	0	21.37
Unknown (Valdez)	4122	FWT II	0.25	15	575	2.69
Total			25.25			202.13

Detailed Line 200: Travel for final FY 20 request for 11220000–11222821.

Item	Cost ($K)
Travel	6.73

Detailed Line 300: Contractual for final FY 20 request for 11220000–11222821.

Item	Cost ($K)
Software licensing	0.8
Postage	0.05
Internet	0.4
Transportation	0.03
Total	1.28

Detailed Line 400: Commodities for final FY 20 request for 11220000–11222821.

Item	Cost ($K)
Operating supplies	2.83

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APPENDIX A: WORK SCHEDULES

Appendix A1.–Kodiak work schedule, 2019.

Date	Day	Duty	Int Areas	Hours	Paperwork due	Comments
May-24	Fri	B+I	132			**Office training**
May-25	Sat	B+I	321	1430–2130		**TRAINING**
May-26	Sun	B+I	213	1430–2130	**WSR, FR, AWL, INTERVIEWS DUE**	**TRAINING**
May-27	Mon	B+I	132	1430–2130		**TRAINING**
May-28	Tue	B+I	321	1430–2130		
May-29	Wed	B+I	213	1430–2130		**Timesheets Due**
May-30	Thu	--Off--				
May-31	Fri	--Off--				**PAYROLL**
Jun-1	Sat	B+I	132	1430–2130		
Jun-2	Sun	B+I	321	1430–2130	**WSR, FR, AWL, INTERVIEWS DUE**	
Jun-3	Mon	B+I	213	1430–2130		
Jun-4	Tue	B+I	132	1430–2130		
Jun-5	Wed	B+I	321	1430–2130		
Jun-6	Thu	--Off--				
Jun-7	Fri	--Off--				
Jun-8	Sat	B+I	132	1430–2130		
Jun-9	Sun	B+I	321	1430–2130	**WSR, FR, AWL, INTERVIEWS DUE**	
Jun-10	Mon	B+I	213	1430–2130		
Jun-11	Tue	B+I	132	1430–2130		
Jun-12	Wed	B+I	321	1430–2130		
Jun-13	Thu	B+I	213	1430–2130		**Timesheets Due**
Jun-14	Fri	B+I	132	1430–2130		**PAYROLL**
Jun-15	Sat	--Off--				
Jun-16	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	
Jun-17	Mon	B+I	132	1430–2130		
Jun-18	Tue	B+I	321	1430–2130		
Jun-19	Wed	B+I	213	1430–2130		
Jun-20	Thu	B+I	132	1430–2130		
Jun-21	Fri	B+I	321	1430–2130		
Jun-22	Sat	--Off--				
Jun-23	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	
Jun-24	Mon	--Off--				
Jun-25	Tue	--Off--				
Jun-26	Wed	B+I	132	1430–2130		**Timesheets Due**
Jun-27	Thu	B+I	321	1430–2130		
Jun-28	Fri	B+I	213	1430–2130		**PAYROLL**
Jun-29	Sat	B+I	132	1430–2130		
Jun-30	Sun	B+I	321	1430–2130	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-1	Mon	B+I	213	1430–2130		**Lingcod season opens**
Jul-2	Tue	--Off--				
Jul-3	Wed	--Off--				
Jul-4	Thu	B+I	132	1430–2130		**Holiday worked**
Jul-5	Fri	B+I	321	1430–2130		
Jul-6	Sat	B+I	213	1430–2130		
Jul-7	Sun	B+I	132	1430–2130	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-8	Mon	B+I	321	1430–2130		
Jul-9	Tue	B+I	213	1430–2130		
Jul-10	Wed	B+I	132	1430–2130		
Jul-11	Thu	--Off--				
Jul-12	Fri	--Off--				

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Date	Day	Duty	Int Areas	Hours	Paperwork due	Comments
Jul-13	Sat	B+I	132	1430–2130		**Timesheets Due**
Jul-14	Sun	B+I	321	1430–2130	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-15	Mon	B+I	213	1430–2130		**PAYROLL**
Jul-16	Tue	B+I	132	1430–2130		
Jul-17	Wed	B+I	321	1430–2130		
Jul-18	Thu	--Off--				
Jul-19	Fri	--Off--				
Jul-20	Sat	B+I	132	1430–2130		
Jul-21	Sun	B+I	321	1430–2130	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-22	Mon	B+I	213	1430–2130		
Jul-23	Tue	--Off--				
Jul-24	Wed	--Off--				
Jul-25	Thu	B+I	132	1430–2130		
Jul-26	Fri	B+I	321	1430–2130		
Jul-27	Sat	B+I	213	1430–2130		
Jul-28	Sun	B+I	132	1430–2130	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-29	Mon	B+I	321	1430–2130		**Timesheets Due**
Jul-30	Tue	B+I	213	1430–2130		
Jul-31	Wed	B+I	132	1430–2130		**PAYROLL**
Aug-1	Thu	B+I	321	1430–2130		
Aug-2	Fri	B+I	213	1430–2130		
Aug-3	Sat	--Off--				
Aug-4	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	

Note: Duty code B+I indicates concurrent biological and interview sampling. Int Areas codes are: 1 = St. Paul's Harbor, 2 = St. Herman's Harbor, and 3 = U.S. Coast Guard Base. Paperwork codes include: WSR = weekly sampling report and FR = fishing report. Horizontal lines delineate workweeks.

Appendix A2.–Homer work schedule, 2019.

Date	Day	Duty	IntAreas	Hours	Paperwork due	Comments
May-9	Thu				**BEGINNING OF FIELD SEASON**	**Office training**
May-10	Fri	B		1400–2100		**TRAINING**
May-11	Sat	B		1400–2100		**TRAINING**
May-12	Sun	I	2413524	1200–1900		**TRAINING**
May-13	Mon	B		1400–2100		**Timesheets Due**
May-14	Tue	I	1352413	1200–1900		
May-15	Wed	B		1400–2100		**PAYROLL**
May-16	Thu	I	3524135	1200–1900		
May-17	Fri	--Off--				
May-18	Sat	--Off--				
May-19	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
May-20	Mon	I	1352413	1200–1900		
May-21	Tue	B		1400–2100		
May-22	Wed	I	1352413	1200–1900		
May-23	Thu	--Off--		1400–2100		
May-24	Fri	--Off--		1400–2100		
May-25	Sat	B		1400–2100		
May-26	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
May-27	Mon	I	3524135	1200–1900		**Holiday worked**
May-28	Tue	B		1400–2100		
May-29	Wed	B		1400–2100		**Timesheets Due**
May-30	Thu	--Off--				
May-31	Fri	--Off--				**PAYROLL**
Jun-1	Sat	B		1400–2100		
Jun-2	Sun	I	3524135	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
Jun-3	Mon	B		1400–2100		
Jun-4	Tue	B		1400–2100		
Jun-5	Wed	I	5241352	1200–1900		
Jun-6	Thu	--Off--				
Jun-7	Fri	--Off--				
Jun-8	Sat	B		1400–2100		
Jun-9	Sun	I	2413524	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
Jun-10	Mon	B		1400–2100		
Jun-11	Tue	I	4135241	1200–1900		
Jun-12	Wed	B		1400–2100		
Jun-13	Thu	B		1400–2100		**Timesheets Due**
Jun-14	Fri	I	4135241	1200–1900		**PAYROLL**
Jun-15	Sat	--Off--				
Jun-16	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	
Jun-17	Mon	B		1400–2100		
Jun-18	Tue	B		1400–2100		
Jun-19	Wed	I	5241352	1200–1900		
Jun-20	Thu	B		1400–2100		
Jun-21	Fri	I	3524135	1200–1900		
Jun-22	Sat	--Off--				
Jun-23	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	

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Date	Day	Duty	IntAreas	Hours	Paperwork due	Comments
Jun-24	Mon	--Off--				
Jun-25	Tue	--Off--				
Jun-26	Wed	B		1400–2100		**Timesheets Due**
Jun-27	Thu	B		1400–2100		
Jun-28	Fri	I	4135241	1200–1900		**PAYROLL**
Jun-29	Sat	I	1352413	1200–1900		
Jun-30	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-1	Mon	B		1400–2100		**Lingcod season opens**
Jul-2	Tue	--Off--				
Jul-3	Wed	--Off--				
Jul-4	Thu	I + L	3524135	1200–1900		**Holiday worked**
Jul-5	Fri	B		1400–2100		
Jul-6	Sat	I + L	3524135	1200–1900		
Jul-7	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-8	Mon	I + L	2413524	1200–1900		
Jul-9	Tue	I + L	4135241	1200–1900		
Jul-10	Wed	B		1400–2100		
Jul-11	Thu	--Off--				
Jul-12	Fri	--Off--				
Jul-13	Sat	B		1400–2100		**Timesheets Due**
Jul-14	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-15	Mon	I + L	1352413	1200–1900		**PAYROLL**
Jul-16	Tue	B		1400–2100		
Jul-17	Wed	B		1400–2100		
Jul-18	Thu	--Off--				
Jul-19	Fri	--Off--				
Jul-20	Sat	B		1400–2100		
Jul-21	Sun	I + L	3524135	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-22	Mon	I + L	5241352	1200–1900		
Jul-23	Tue	--Off--				
Jul-24	Wed	--Off--				
Jul-25	Thu	B		1400–2100		
Jul-26	Fri	B		1400–2100		
Jul-27	Sat	I + L	5241352	1200–1900		
Jul-28	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
Jul-29	Mon	I + L	2413524	1200–1900		**Timesheets Due**
Jul-30	Tue	B		1400–2100		
Jul-31	Wed	B		1400–2100		**PAYROLL**
Aug-1	Thu	B		1400–2100		
Aug-2	Fri	I + L	4135241	1200–1900		
Aug-3	Sat	--Off--				
Aug-4	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	

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Date	Day	Duty	IntAreas	Hours	Paperwork due	Comments
Aug-5	Mon	B		1400–2100		
Aug-6	Tue	I + L	3524135	1200–1900		
Aug-7	Wed	I + L	3524135	1200–1900		
Aug-8	Thu	B		1400–2100		
Aug-9	Fri	--Off--				
Aug-10	Sat	--Off--				
Aug-11	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
Aug-12	Mon	I + L	2413524	1200–1900		
Aug-13	Tue	B		1400–2100		**Timesheets Due**
Aug-14	Wed	I + L	4135241	1200–1900		
Aug-15	Thu	B		1400–2100		**PAYROLL**
Aug-16	Fri	B		1400–2100		
Aug-17	Sat	--Off--				
Aug-18	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	
Aug-19	Mon	I + L	1352413	1200–1900		
Aug-20	Tue	B		1400–2100		
Aug-21	Wed	B		1400–2100		
Aug-22	Thu	B		1400–2100		
Aug-23	Fri	--Off--				
Aug-24	Sat	--Off--				
Aug-25	Sun	I + L	3524135	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
Aug-26	Mon	I + L	5241352	1200–1900		
Aug-27	Tue	B		1400–2100		
Aug-28	Wed	I + L	5241352	1200–1900		**Timesheets Due**
Aug-29	Thu	B		1400–2100		
Aug-30	Fri	--Off--				**PAYROLL**
Aug-31	Sat	--Off--				
Sep-1	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
Sep-2	Mon	I + L	2413524	1200–1900		
Sep-3	Tue	B		1400–2100		

Note: Duty codes include: B = biological sampling for all species, I = interview sampling, and I+L = interviews with lingcod sampling. Paperwork codes include: WSR = weekly sampling report and FR = fishing report. Horizontal lines delineate workweeks.

Appendix A3.–Central Cook Inlet work schedule, 2019.

Date	Day	Duty	Tide	Loc	Shift	Paperwork due	Comments
May-9	Thu						**TRAINING**
May-10	Fri	B	722	Deep Cr.	1200–1800		**TRAINING**
May-11	Sat	B	825	Deep Cr.	1200–1800		**TRAINING**
May-12	Sun	I	956	Anchor Pt.	1200–1800		
May-13	Mon	B	1137	Anchor Pt.	1300–1900		**Timesheets**
May-14	Tue	I	1255	Deep Cr.	1300–1900		
May-15	Wed	B	1357	Deep Cr.	1300–1900		**PAYROLL**
May-16	Thu	I	1449	Deep Cr.	1300–1900		
May-17	Fri	--Off--	1536				
May-18	Sat	--Off--	1620				
May-19	Sun	B	413	Anchor Pt.	1200–1800	**WSR, FR, AWL, INTERVIEWS**	
May-20	Mon	I	451	Deep Cr.	1000–1600		
May-21	Tue	B	528	Deep Cr.	1000–1600		
May-22	Wed	I	605	Anchor Pt.	1200–1800		
May-23	Thu	--Off--	643				
May-24	Fri	--Off--	724				
May-25	Sat	B	817	Anchor Pt.	1200–1800		
May-26	Sun	B	932	Deep Cr.	1300–1900	**WSR, FR, AWL, INTERVIEWS**	
May-27	Mon	I	1105	Anchor Pt.	1200–1800		**Holiday Pay**
May-28	Tue	B	1222	Anchor Pt.	1200–1800		
May-29	Wed	B	1321	Deep Cr.	1500–2100		**Timesheets**
May-30	Thu	--Off--	1408				
May-31	Fri	--Off--	1450				**PAYROLL**
Jun-1	Sat	B	1529	Anchor Pt.	1200–1800		
Jun-2	Sun	I	1607	Deep Cr.	1000–1600	**WSR, FR, AWL, INTERVIEWS**	
Jun-3	Mon	B	348	Deep Cr.	1000–1600		
Jun-4	Tue	B	424	Anchor Pt.	1200–1800		
Jun-5	Wed	I	502	Deep Cr.	1000–1600		
Jun-6	Thu	--Off--	543				
Jun-7	Fri	--Off--	629				
Jun-8	Sat	B	721	Anchor Pt.	1200–1800		
Jun-9	Sun	I	826	Deep Cr.	1200–1800	**WSR, FR, AWL, INTERVIEWS**	
Jun-10	Mon	B	948	Deep Cr.	1300–1900		
Jun-11	Tue	I	1118	Deep Cr.	1500–2100		
Jun-12	Wed	B	1237	Anchor Pt.	1200–1800		**Timesheets**
Jun-13	Thu	B	1342	Anchor Pt.	1200–1800		
Jun-14	Fri	I	1436	Anchor Pt.	1200–1800		**PAYROLL**
Jun-15	Sat	--Off--	1525				
Jun-16	Sun	--Off--	1610			**WSR, FR, AWL, INTERVIEWS**	
Jun-17	Mon	B	353	Deep Cr.	1000–1600		
Jun-18	Tue	B	432	Deep Cr.	1000–1600		
Jun-19	Wed	I	509	Deep Cr.	1000–1600		
Jun-20	Thu	B	546	Deep Cr.	1000–1600		
Jun-21	Fri	I	623	Deep Cr.	1000–1600		
Jun-22	Sat	--Off--	702				
Jun-23	Sun	--Off--	746			**WSR, FR, AWL, INTERVIEWS**	

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Date	Day	Duty	Tide	Loc	Shift	Paperwork due	Comments
Jun-24	Mon	--Off--	841				
Jun-25	Tue	--Off--	954				
Jun-26	Wed	B	1117	Deep Cr.	1500–2100		**Timesheets**
Jun-27	Thu	B	1231	Deep Cr.	1500–2100		
Jun-28	Fri	I	1331	Deep Cr.	1500–2100		**PAYROLL**
Jun-29	Sat	I	1421	Anchor Pt.	1200–1800		
Jun-30	Sun	B	1506	Deep Cr.	1500–2100	**WSR, FR, AWL, INTERVIEWS**	
Jul-1	Mon	B	1548	Anchor Pt.	1200–1800		**Lingcod**
Jul-2	Tue	--Off--	1631				
Jul-3	Wed	--Off--	406				
Jul-4	Thu	I	450	Deep Cr.	1000–1600		**Holiday Pay**
Jul-5	Fri	B	536	Deep Cr.	1000–1600		
Jul-6	Sat	I	625	Deep Cr.	1000–1600		
Jul-7	Sun	B	718	Anchor Pt.	1200–1800	**WSR, FR, AWL, INTERVIEWS**	
Jul-8	Mon	I	819	Deep Cr.	1200–1800		
Jul-9	Tue	I	932	Deep Cr.	1300–1900		
Jul-10	Wed	B	1055	Deep Cr.	1400–2000		
Jul-11	Thu	--Off--	1217				
Jul-12	Fri	--Off--	1328				
Jul-13	Sat	B	1427	Anchor Pt.	1200–1800		**Timesheets**
Jul-14	Sun	B	1517	Deep Cr.	1500–2100	**WSR, FR, AWL, INTERVIEWS**	
Jul-15	Mon	I	1601	Anchor Pt.	1200–1800		**PAYROLL**
Jul-16	Tue	B	340	Deep Cr.	1000–1600		
Jul-17	Wed	B	419	Deep Cr.	1000–1600		
Jul-18	Thu	--Off--	456				
Jul-19	Fri	--Off--	531				
Jul-20	Sat	B	606	Deep Cr.	1000–1600		
Jul-21	Sun	I	641	Anchor Pt.	1200–1800	**WSR, FR, AWL, INTERVIEWS**	
Jul-22	Mon	I	717	Deep Cr.	1000–1600		
Jul-23	Tue	--Off--	800				
Jul-24	Wed	--Off--	853				
Jul-25	Thu	B	1006	Deep Cr.	1400–2000		
Jul-26	Fri	B	1136	Deep Cr.	1500–2100		
Jul-27	Sat	I	1255	Deep Cr.	1500–2100		
Jul-28	Sun	B	1355	Anchor Pt.	1200–1800	**WSR, FR, AWL, INTERVIEWS**	
Jul-29	Mon	I	1445	Deep Cr.	1500–2100		**Timesheets**
Jul-30	Tue	B	1530	Anchor Pt.	1200–1800		
Jul-31	Wed	B	1613	Deep Cr.	1000–1600		**PAYROLL**
Aug-1	Thu	B	355	Deep Cr.	1000–1600		
Aug-2	Fri	I	442	Deep Cr.	1000–1600		
Aug-3	Sat	--Off--	529				
Aug-4	Sun	--Off--	617			**WSR, FR, AWL, INTERVIEWS**	
Aug-5	Mon	B	708	Deep Cr.	1000–1600		
Aug-6	Tue	I	804	Deep Cr.	1100–1700		
Aug-7	Wed	I	909	Deep Cr.	1300–1900		
Aug-8	Thu	B	1030	Anchor Pt.	1200–1800		
Aug-9	Fri	--Off--	1159				
Aug-10	Sat	--Off--	1317				
Aug-11	Sun	B	1418	Deep Cr.	1500–2100	**WSR, FR, AWL, INTERVIEWS**	

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Date	Day	Duty	Tide	Loc	Shift	Paperwork due	Comments
Aug-12	Mon	I	1506	Deep Cr.	1500–2100		
Aug-13	Tue	B	1546	Deep Cr.	1000–1600		**Timesheets**
Aug-14	Wed	I	330	Anchor Pt.	1200–1800		
Aug-15	Thu	B	407	Deep Cr.	1000–1600		**PAYROLL**
Aug-16	Fri	B	442	Deep Cr.	1000–1600		
Aug-17	Sat	--Off--	515				
Aug-18	Sun	--Off--	546			**WSR, FR, AWL, INTERVIEWS**	
Aug-19	Mon	I	618	Deep Cr.	1000–1600		
Aug-20	Tue	B	650	Deep Cr.	1000–1600		
Aug-21	Wed	B	726	Deep Cr.	1000–1600		
Aug-22	Thu	B	809	Anchor Pt.	1200–1800		
Aug-23	Fri	--Off--	910				
Aug-24	Sat	--Off--	1043				
Aug-25	Sun	I	1224	Deep Cr.	1500–2100	**WSR, FR, AWL, INTERVIEWS**	
Aug-26	Mon	I	1334	Deep Cr.	1500–2100		
Aug-27	Tue	B	1425	Anchor Pt.	1200–1800		
Aug-28	Wed	I	1509	Anchor Pt.	1200–1800		**Timesheets**
Aug-29	Thu	B	1550	Deep Cr.	1000–1600		
Aug-30	Fri	--Off--	345				**PAYROLL**
Aug-31	Sat	--Off--	432				
Sep-1	Sun	B	518	Anchor Pt.	1200–1800	**WSR, FR, AWL, INTERVIEWS**	
Sep-2	Mon	I	604	Deep Cr.	1000–1600		
Sep-3	Tue	B	652	Deep Cr.	1000–1600		

Note: Duty codes include: B = biological sampling for all species, I = interview sampling. Paperwork codes include: WSR = weekly sampling report and FR = fishing report. Horizontal lines delineate workweeks.

Appendix A4.–Seward work schedule, 2019.

Date	Day	Duty	IntAreas	IntHours	Paperwork Due	Comments
17 May	Fri	B		1400–2100		**TRAINING**
18 May	Sat	I	2341234	1200–1900		**TRAINING**
19 May	Sun	B		1400–2100		**TRAINING**
20 May	Mon	I	3412341	1400–2100		
21 May	Tue	B		1400–2100		
22 May	Wed	I	4123412	1200–1900		
23 May	Thu	--Off--				
24 May	Fri	--Off--				
25 May	Sat	B		1400–2100		
26 May	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
27 May	Mon	I	3412341	1200–1900		**Holiday worked**
28 May	Tue	B		1400–2100		
29 May	Wed	B		1400–2100		**Timesheets Due**
30 May	Thu	--Off--		1200–1900		
31 May	Fri	--Off--		1200–1900		**PAYROLL**
1 Jun	Sat	B		1400–2100		
2 Jun	Sun	I	1234123	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
3 Jun	Mon	B		1400–2100		
4 Jun	Tue	B		1400–2100		
5 Jun	Wed	I	4123412	1200–1900		
6 Jun	Thu	--Off--				
7 Jun	Fri	--Off--				
8 Jun	Sat	B		1400–2100		
9 Jun	Sun	I	3412341	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
10 Jun	Mon	B		1400–2100		
11 Jun	Tue	I	1234123	1200–1900		
12 Jun	Wed	B		1400–2100		
13 Jun	Thu	B		1400–2100		**Timesheets Due**
14 Jun	Fri	I	1234123	1200–1900		**PAYROLL**
15 Jun	Sat	--Off--				
16 Jun	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	
17 Jun	Mon	B		1400–2100		
18 Jun	Tue	B		1400–2100		
19 Jun	Wed	I	4123412	1200–1900		
20 Jun	Thu	B		1400–2100		
21 Jun	Fri	I	3412341	1200–1900		
22 Jun	Sat	--Off--				
23 Jun	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	
24 Jun	Mon	--Off--				
25 Jun	Tue	--Off--				
26 Jun	Wed	B		1400–2100		**Timesheets Due**
27 Jun	Thu	B		1400–2100		
28 Jun	Fri	I	1234123	1200–1900		**PAYROLL**
29 Jun	Sat	I	4123412	1200–1900		
30 Jun	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	

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Date	Day	Duty	IntAreas	IntHours	Paperwork Due	Comments
1 Jul	Mon	B		1400–2100		**Lingcod season opens**
2 Jul	Tue	--Off--				
3 Jul	Wed	--Off--				
4 Jul	Thu	I + L	3412341	1200–1900		**Holiday worked**
5 Jul	Fri	B		1400–2100		
6 Jul	Sat	I + L	1234123	1200–1900		
7 Jul	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
8 Jul	Mon	I + L	4123412	1200–1900		
9 Jul	Tue	I + L	3412341	1200–1900		
10 Jul	Wed	B		1400–2100		
11 Jul	Thu	--Off--				
12 Jul	Fri	--Off--				
13 Jul	Sat	B		1400–2100		**Timesheets Due**
14 Jul	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
15 Jul	Mon	I + L	1234123	1200–1900		**PAYROLL**
16 Jul	Tue	B		1400–2100		
17 Jul	Wed	B		1400–2100		
18 Jul	Thu	--Off--				
19 Jul	Fri	--Off--				
20 Jul	Sat	B		1400–2100		
21 Jul	Sun	I + L	3412341	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
22 Jul	Mon	I + L	1234123	1200–1900		
23 Jul	Tue	--Off--				
24 Jul	Wed	--Off--				
25 Jul	Thu	B		1400–2100		
26 Jul	Fri	B		1400–2100		
27 Jul	Sat	I + L	3412341	1200–1900		
28 Jul	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
29 Jul	Mon	I + L	1234123	1200–1900		**Timesheets Due**
30 Jul	Tue	B		1400–2100		
31 Jul	Wed	B		1400–2100		**PAYROLL**
1 Aug	Thu	B		1400–2100		
2 Aug	Fri	--Off--	4123412	1200–1900		
3 Aug	Sat	--Off--				
4 Aug	Sun	I + L	4123412	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
5 Aug	Mon	B		1400–2100		
6 Aug	Tue	I + L	3412341	1200–1900		
7 Aug	Wed	I + L	1234123	1200–1900		
8 Aug	Thu	B		1400–2100		
9 Aug	Fri	--Off--				
10 Aug	Sat	--Off--				
11 Aug	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	

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Date	Day	Duty	IntAreas	IntHours	Paperwork Due	Comments
12 Aug	Mon	I + L	4123412	1200–1900		
13 Aug	Tue	B		1400–2100		**Timesheets Due**
14 Aug	Wed	I + L	1234123	1200–1900		
15 Aug	Thu	B		1400–2100		**PAYROLL**
16 Aug	Fri	B		1400–2100		
17 Aug	Sat	--Off--				
18 Aug	Sun	--Off--			**WSR, FR, AWL, INTERVIEWS DUE**	
19 Aug	Mon	I + L	1234123	1200–1900		
20 Aug	Tue	B		1400–2100		
21 Aug	Wed	B		1400–2100		
22 Aug	Thu	B		1400–2100		
23 Aug	Fri	--Off--				
24 Aug	Sat	--Off--				
25 Aug	Sun	I + L	3412341	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
26 Aug	Mon	I + L	4123412	1200–1900		
27 Aug	Tue	B		1400–2100		
28 Aug	Wed	I + L	3412341	1200–1900		**Timesheets Due**
29 Aug	Thu	B		1400–2100		
30 Aug	Fri	--Off--				**PAYROLL**
31 Aug	Sat	--Off--				
1 Sep	Sun	B		1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
2 Sep	Mon	I + L	1234123	1200–1900		
3 Sep	Tue	B		1400–2100		

Note: Duty codes include: B = biological sampling for all species, I = interview sampling. Paperwork codes include: WSR = weekly sampling report and FR = fishing report. Horizontal lines delineate workweeks.

Appendix A5.–Whittier work schedule, 2019.

Date	Day	Duty	Hours	Paperwork due	Comments
30 May	Thu				**Training**
31 May	Fri	I	1200–1900		**Training**
1 Jun	Sat	B	1400–2100		**Training**
2 Jun	Sun	B	1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	**Training**
3 Jun	Mon	I	1200–1900		
4 Jun	Tue	B	1400–2100		
5 Jun	Wed	I	1200–1900		
6 Jun	Thu	--Off--			
7 Jun	Fri	--Off--			
8 Jun	Sat	B	1400–2100		
9 Jun	Sun	I	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	
10 Jun	Mon	B	1400–2100		
11 Jun	Tue	I	1200–1900		
12 Jun	Wed	B	1400–2100		**Timesheets Due**
13 Jun	Thu	B	1400–2100		
14 Jun	Fri	I	1200–1900		**PAYROLL**
15 Jun	Sat	--Off--			
16 Jun	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	
17 Jun	Mon	B	1400–2100		
18 Jun	Tue	B	1400–2100		
19 Jun	Wed	I	1200–1900		
20 Jun	Thu	B	1400–2100		
21 Jun	Fri	I	1200–1900		
22 Jun	Sat	--Off--			
23 Jun	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	
24 Jun	Mon	--Off--			
25 Jun	Tue	--Off--			
26 Jun	Wed	B	1400–2100		**Timesheets Due**
27 Jun	Thu	B	1400–2100		
28 Jun	Fri	I	1200–1900		**PAYROLL**
29 Jun	Sat	I	1200–1900		
30 Jun	Sun	B	1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
1 Jul	Mon	B	1400–2100		**Lingcod season opens**
2 Jul	Tue	--Off--			
3 Jul	Wed	--Off--			
4 Jul	Thu	I + L	1200–1900		**Holiday worked**
5 Jul	Fri	B	1400–2100		
6 Jul	Sat	I + L	1200–1900		
7 Jul	Sun	B	1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
8 Jul	Mon	I + L	1200–1900		
9 Jul	Tue	I + L	1200–1900		
10 Jul	Wed	B	1400–2100		
11 Jul	Thu	--Off--			
12 Jul	Fri	--Off--			

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Date	Day	Duty	Hours	Paperwork due	Comments
13 Jul	Sat	B	1400–2100		**Timesheets Due**
14 Jul	Sun	B	1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
15 Jul	Mon	I + L	1500–2200		**PAYROLL**
16 Jul	Tue	B	1500–2200		
17 Jul	Wed	B	1500–2200		
18 Jul	Thu	B	1500–2200		
19 Jul	Fri	I + L	1500–2200		
20 Jul	Sat	--Off--			
21 Jul	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	
22 Jul	Mon	--Off--			
23 Jul	Tue	--Off--			
24 Jul	Wed	I + L	1500–2200		
25 Jul	Thu	B	1500–2200		
26 Jul	Fri	B	1500–2200		
27 Jul	Sat	I + L	1500–2200		
28 Jul	Sun	B	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
29 Jul	Mon	I + L	1200–1900		**Timesheets Due**
30 Jul	Tue	B	1400–2100		
31 Jul	Wed	B	1400–2100		**PAYROLL**
1 Aug	Thu	B	1400–2100		
2 Aug	Fri	I + L	1200–1900		
3 Aug	Sat	--Off--			
4 Aug	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	
5 Aug	Mon	B	1400–2100		
6 Aug	Tue	I + L	1200–1900		
7 Aug	Wed	I + L	1200–1900		
8 Aug	Thu	B	1400–2100		
9 Aug	Fri	--Off--			
10 Aug	Sat	--Off--			
11 Aug	Sun	B	1400–2100	**WSR, FR, AWL, INTERVIEWS DUE**	
12 Aug	Mon	I + L	1200–1900		
13 Aug	Tue	B	1400–2100		**Timesheets Due**
14 Aug	Wed	I + L	1200–1900		
15 Aug	Thu	B	1400–2100		**PAYROLL**
16 Aug	Fri	B	1400–2100		
17 Aug	Sat	--Off--			
18 Aug	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	
19 Aug	Mon	I + L	1200–1900		
20 Aug	Tue	B	1400–2100		
21 Aug	Wed	B	1400–2100		
22 Aug	Thu	B	1400–2100		
23 Aug	Fri	--Off--			
24 Aug	Sat	--Off--			
25 Aug	Sun	I + L	1200–1900	**WSR, FR, AWL, INTERVIEWS DUE**	

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Date	Day	Duty	Hours	Paperwork due	Comments
26 Aug	Mon	I + L	1200–1900		
27 Aug	Tue	B	1400–2100		
28 Aug	Wed	I + L	1200–1900		**Timesheets Due**
29 Aug	Thu	B	1400–2100		
30 Aug	Fri	--Off--			**PAYROLL**
31 Aug	Sat	--Off--			

Note: Duty codes include: B = biological sampling for all species, I = interview sampling, and I+L = interviews with lingcod sampling. Paperwork codes include: WSR = weekly sampling report and FR = fishing report. Horizontal lines delineate workweeks.

Appendix A6.–Valdez work schedule, 2019.

Date	Day	Duty	Hours	Paperwork Due	Comments
24 May	Fri	B	1500–2200		**TRAINING**
25 May	Sat	I	1500–2200		**TRAINING**
26 May	Sun	B	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	**TRAINING**
27 May	Mon	I	1500–2200		**Holiday worked**
28 May	Tue	B	1500–2200		
29 May	Wed	B	1500–2200		**Timesheets Due**
30 May	Thu	--Off--			
31 May	Fri	--Off--			**PAYROLL**
1 Jun	Sat	B	1500–2200		
2 Jun	Sun	I	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
3 Jun	Mon	B	1500–2200		
4 Jun	Tue	B	1500–2200		
5 Jun	Wed	I	1500–2200		
6 Jun	Thu	--Off--			
7 Jun	Fri	--Off--			
8 Jun	Sat	B	1500–2200		
9 Jun	Sun	I	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
10 Jun	Mon	B	1500–2200		
11 Jun	Tue	I	1500–2200		
12 Jun	Wed	B	1500–2200		
13 Jun	Thu	B	1500–2200		**Timesheets Due**
14 Jun	Fri	I	1500–2200		**PAYROLL**
15 Jun	Sat	--Off--			
16 Jun	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	
17 Jun	Mon	B	1500–2200		
18 Jun	Tue	B	1500–2200		
19 Jun	Wed	I	1500–2200		
20 Jun	Thu	B	1500–2200		
21 Jun	Fri	I	1500–2200		
22 Jun	Sat	--Off--			
23 Jun	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	
24 Jun	Mon	--Off--			
25 Jun	Tue	--Off--			
26 Jun	Wed	B	1500–2200		**Timesheets Due**
27 Jun	Thu	B	1500–2200		
28 Jun	Fri	I	1500–2200		**PAYROLL**
29 Jun	Sat	I	1500–2200		
30 Jun	Sun	B	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
1 Jul	Mon	B	1500–2200		**Lingcod season opens**
2 Jul	Tue	--Off--			
3 Jul	Wed	--Off--			
4 Jul	Thu	I + L	1500–2200		**Holiday worked**
5 Jul	Fri	B	1500–2200		
6 Jul	Sat	I + L	1500–2200		
7 Jul	Sun	B	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	

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Date	Day	Duty	Hours	Paperwork Due	Comments
8 Jul	Mon	I + L	1500–2200		
9 Jul	Tue	I + L	1500–2200		
10 Jul	Wed	B	1500–2200		
11 Jul	Thu	--Off--			
12 Jul	Fri	--Off--			
13 Jul	Sat	B	1500–2200		**Timesheets Due**
14 Jul	Sun	B	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
15 Jul	Mon	I + L	1500–2200		**PAYROLL**
16 Jul	Tue	B	1500–2200		
17 Jul	Wed	B	1500–2200		
18 Jul	Thu	--Off--			
19 Jul	Fri	--Off--			
20 Jul	Sat	B	1500–2200		
21 Jul	Sun	I + L	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
22 Jul	Mon	I + L	1500–2200		
23 Jul	Tue	--Off--			
24 Jul	Wed	--Off--			
25 Jul	Thu	B	1500–2200		
26 Jul	Fri	B	1500–2200		
27 Jul	Sat	I + L	1500–2200		
28 Jul	Sun	B	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
29 Jul	Mon	I + L	1500–2200		**Timesheets Due**
30 Jul	Tue	B	1500–2200		
31 Jul	Wed	B	1500–2200		**PAYROLL**
1 Aug	Thu	B	1500–2200		
2 Aug	Fri	I + L	1500–2200		
3 Aug	Sat	--Off--			
4 Aug	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	
5 Aug	Mon	B	1500–2200		
6 Aug	Tue	I + L	1500–2200		
7 Aug	Wed	I + L	1500–2200		
8 Aug	Thu	B	1500–2200		
9 Aug	Fri	--Off--			
10 Aug	Sat	--Off--			
11 Aug	Sun	B	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
12 Aug	Mon	I + L	1500–2200		
13 Aug	Tue	B	1500–2200		**Timesheets Due**
14 Aug	Wed	I + L	1500–2200		
15 Aug	Thu	B	1500–2200		**PAYROLL**
16 Aug	Fri	B	1500–2200		
17 Aug	Sat	--Off--			
18 Aug	Sun	--Off--		**WSR, FR, AWL, INTERVIEWS DUE**	

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Date	Day	Duty	Hours	Paperwork Due	Comments
19 Aug	Mon	I + L	1500–2200		
20 Aug	Tue	B	1500–2200		
21 Aug	Wed	B	1500–2200		
22 Aug	Thu	B	1500–2200		
23 Aug	Fri	--Off--			
24 Aug	Sat	--Off--			
25 Aug	Sun	I + L	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
26 Aug	Mon	I + L	1500–2200		
27 Aug	Tue	B	1500–2200		
28 Aug	Wed	I + L	1500–2200		**Timesheets Due**
29 Aug	Thu	B	1500–2200		
30 Aug	Fri	--Off--			**PAYROLL**
31 Aug	Sat	--Off--			
1 Sep	Sun	B	1500–2200	**WSR, FR, AWL, INTERVIEWS DUE**	
2 Sep	Mon	I + L	1500–2200		
3 Sep	Tue	B	1500–2200		

Note: Duty codes include: B = biological sampling for all species, I = interview sampling, and I+L = interviews with lingcod sampling. Paperwork codes include: WSR = weekly sampling report and FR = fishing report. Horizontal lines delineate workweeks.

APPENDIX B: SHARK DATA COLLECTION PROCEDURES

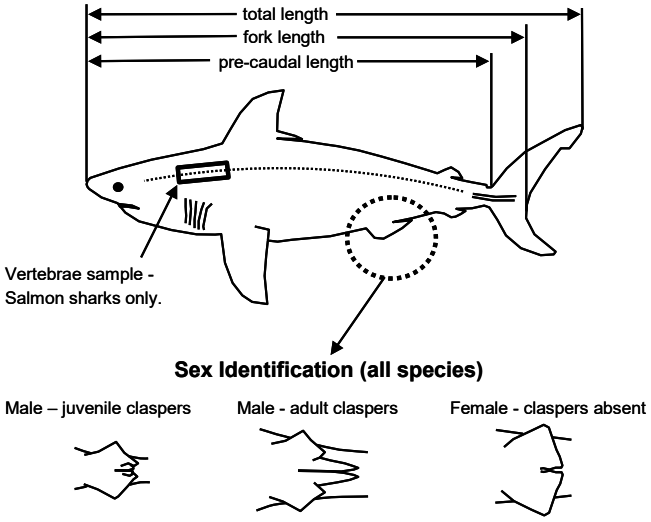
Appendix B1.–Shark data collection procedures, 2019.

Alaska Department of Fish and Game
Division of Sport Fish

Shark Data Collection

Salmon shark:

1. Record the following data on data form:
   - Port, Date, User Group (private/charter).
   - Total, fork, and pre-caudal lengths (cm)
   - Sex (see below) and male clasper lengths of salmon sharks
   - Lat / long (preferred) or stat area of capture
2. Remove a 6-inch long piece of vertebrae and freeze in ziplock with data form.



Spiny dogfish:

1. Record the following data on small coin envelope:
   - Port, Date, User Group (private/charter).
   - Total length (cm) and Round Wt (kg)
   - Sex (see above)
   - Lat / long (preferred) or stat area of capture
2. Remove the posterior dorsal fin spine and place in coin envelope.

Sleeper and other sharks:

Record the following data on small coin envelope:
- Species
- Port, Date, User Group (private/charter).
- Total length (cm)
- Sex (see above)
- Lat / long (preferred) or stat area of capture

APPENDIX C: ANGLER INTERVIEWS

Appendix C1.–Standardized procedures and questions for angler interviews, 2019.

1) Introduction and background

Example Question	Background Info
"Hi, I'm XXX with the Alaska Department of Fish and Game. Would you be willing to provide some information about your fishing trip today to assist the department with fishery monitoring?	Introduce yourself as a department employee gathering information for fishery monitoring. If they refuse to participate, thank them and move on to the next interview. You can skip the intro once you have established a rapport with a charter operator.

2) Establish whether you should complete the interview: you will interview anyone who fishes for halibut, other bottomfish, or sharks, or catches one of these species while targeting salmon.

Example Question	Background Info
"What species were you fishing for today?"	1. If they targeted halibut, rockfish, lingcod or other bottomfish (including sharks), record the appropriate target species category and continue with the interview. Ask follow up questions to correctly classify the target. For example, if their initial response is "halibut," ask if they targeted any other species for a portion of the trip. 2. If they were NOT targeting one of the species listed, proceed with the next question.
"Did you catch any halibut, rockfish, lingcod, or sharks while targeting salmon?"	1. If "yes," record the target and complete the interview. 2. If "no," abort the interview and thank them for cooperating.

3) Collect user, effort, and area information

Example Question	Background Info
"Was this a charter (guided) or private fishing trip?"	Remember that when guides take friends or other people fishing for free, it's a private trip. If any of the anglers are paying clients, consider it a charter trip and validate the halibut harvest if you can.
"What is your boat name?"	Charter boats only—no need to record boat names of private boats.
"What is your logbook number?	Charter boats only—Record the 6-digit number stamped in the upper right corner of the logbook (valid numbers are 180000-183500)
"Is this your first trip of the day?"	Record whether this was the boat's first or second trip of the day (some charter boats make 2 trips per day).
"Were you out for more than one day?"	If they were out for portions of more than one calendar day, record the number of days where fishing occurred. For example, if the boat was out for a week but people only fished 3 days, enter three days.

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Example Question	Background Info
"In which stat area were most of your fish caught?"	Show them the stat area map and help identify landmarks, particularly the 3-nautical-mile line. If necessary, follow up with more specific questions regarding location and depth to get the correct stat area. Reassure reluctant people that the information is confidential, and that we're not looking for specific spots, but rather only stat areas.
"Were you fishing north or south of a line connecting Cape Resurrection and Cape Aialik?"	**Seward only—**This question needs to be asked if the anglers report fishing in stat areas 495932 or 495938. Record the response as either (1) Inside Res. Bay, (2) Outside Res. Bay, or (3) Both. All other interviews should be coded as Outside.
"How many clients or comps were fishing?" ("Comps" are people that fished for free)	Record the number of **angler-days, not anglers.** An angler-day is defined as an angler fishing any portion of a day. If the boat was only out for one day, the number of anglers is the number of angler-days. If the boat was out for more than one day, sum the number of people that fished each day to get the total angler-days. Count anyone on board the vessel, including people that fished for free, if they fished for at least 30 minutes or caught any fish.
"Did the skipper or deckhands fish also?"	Record the number of angler-days for captain and crew as above. Captain and crew are allowed to fish in 2019 but may not retain halibut while paying clients are onboard.
"What time did you start fishing at your first spot?…What time did you stop fishing at your last spot?"	Use the answers to determine the time spent fishing and moving between fishing spots. If a multi-day trip, record the total for all days. Do not include large chunks of time spent in other activities when no gear was in the water. Record fishing time to the nearest 15 minutes (0.25 hours).

4) Collect catch and harvest information: Start by asking whether they caught anything at all. Once you start into these questions, periodically ask if they caught any other fish in order to expedite the interview. Probe for additional information until you are sure they accurately identified the fish they caught. For multi-day trips record the totals for the entire trip.

Example Question	Background Info
"How many halibut did you keep (harvest)?"	Record total harvest for the boat-party, including fish cleaned or eaten at sea. Enter the sum for the entire trip, even if it lasted more than 1 day. If all of the halibut that were harvested are available and in sight, count them and enter a "Y" in the HA_KPT_VER field to indicate that the halibut harvest was verified, otherwise enter "N." The harvest should not exceed 2 times the number of client or comp angler-days. Proxy fishing is not allowed for halibut.

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Example Question	Background Info
"Of the halibut you kept, how many did you clean at sea?"	The question is asked assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of halibut kept.
"How many halibut did you release that were caught on circle hooks?" *"How many halibut did you release that were caught on all other hook types?"*	These questions may be difficult for private anglers and charter skippers to recall. Ask them to estimate as close as possible. The questions about hook use will be used in the estimation of release mortality.
"How many pelagic rockfish did you keep?"	Pelagic assemblage includes primarily black, dusky, and yellowtail rockfish ("black bass"). If all of the pelagic rockfish that were harvested are available and in sight, count them and enter "Y" in the validation field.
"Of the pelagic rockfish you kept, how many did you clean at sea?"	The question is asked to assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of pelagic rockfish kept.
"How many pelagic rockfish were released at the surface?"	Include all pelagic rockfish released at the surface (even dead fish), except those that were vented or fizzed.
"How many pelagic rockfish did you release at depth?"	Include all pelagic rockfish released at depth with a deepwater release mechanism, even dead fish.
"How many pelagic rockfish were vented or fizzed?"	Include all pelagic rockfish that were vented or fizzed then released, even dead fish. Venting or fizzing refers to the practice of puncturing the swim bladder to allow the fish to submerge.
"What was the average depth of capture for the pelagic rockfish you released?"	Reiterate that this is the depth of capture for pelagic rockfish released, not kept. This may be difficult for anglers and charter operators to estimate but ask them to take their best guess. This information will be used for estimation of rockfish mortality.
"How many yelloweye rockfish did you keep?"	If all the yelloweye rockfish that were harvested are available and in sight, count them and enter a "Y" in the validation field.
"Of the yelloweye rockfish you kept, how many did you clean at sea?"	The question is asked to assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of yelloweye rockfish kept.
"How many yelloweye rockfish were released at the surface?"	Include all yelloweye rockfish released at the surface (even dead fish), except those that were vented or fizzed.
"How many yelloweye rockfish did you release at depth?"	Include all yelloweye rockfish released at depth with a deepwater release mechanism, even dead fish.

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Example Question	Background Info
"How many yelloweye rockfish were vented or fizzed?"	Include all yelloweye rockfish that were vented or fizzed then released, even dead fish. Venting or fizzing refers to the practice of puncturing the swim bladder to allow the fish to submerge.
"What was the average depth of capture for the yelloweye rockfish you released?"	Reiterate that this is the depth of capture for yelloweye rockfish released, not kept. This may be difficult for anglers and charter operators to estimate but ask them to take their best guess. This information will be used for estimation of rockfish mortality.
"How many other (non-pelagic) rockfish did you keep?"	If all of the non-pelagic rockfish (not including yelloweye) that were harvested are available and in sight, count them and enter "Y" in the validation field.
"Of the other non-pelagic rockfish you kept, how many did you clean at sea?"	The question is asked to assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of non-pelagic rockfish kept.
"How many other (non-pelagic) rockfish were released at the surface?"	Include all other (non-pelagic) rockfish released at the surface (even dead fish), except those that were vented or fizzed.
"How many other (non-pelagic) rockfish did you release at depth?"	Include all other (non-pelagic) rockfish released at depth with a deepwater release mechanism, even dead fish.
"How many other (non-pelagic) rockfish were vented or fizzed?"	Include all other (non-pelagic) rockfish that were vented or fizzed then released, even dead fish. Venting or fizzing refers to the practice of puncturing the swim bladder to allow the fish to submerge.
"What was the average depth of capture for the non-pelagic rockfish you released?"	Reiterate that this is the depth of capture for non-pelagic rockfish released, not kept. This may be difficult for anglers and charter operators to estimate but ask them to take their best guess. This information will be used for estimation of rockfish mortality.
"How many lingcod did you keep?"	If all of the lingcod that were harvested are available and in sight, count them and enter "Y" in the validation field.
"Of the lingcod you kept, how many did you clean at sea?"	Again, the question is asked to assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of lingcod kept.
"How many lingcod 35 inches and larger did you release?" *"How many lingcod less than 35 inches did you release?"*	Include all lingcod released, regardless of release condition. The questions are broken down by size category for stock assessment purposes.

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Example Question	Background Info
"How many Pacific cod (or gray cod) did you keep?"	Include all cod killed and cut up for bait. Validate numbers if fish are available. Do not include Walleye Pollock or sablefish (black cod), you will ask the same questions for both species as you are asking for Pacific cod.
"Of the Pacific cod you kept, how many did you clean at sea?"	This number cannot exceed the number of Pacific cod kept, but should include all Pacific cod killed and cut up for bait.
"How many Pacific cod (gray cod) did you release?"	Include all cod released, regardless of release condition.
"How many sablefish (or black cod) did you keep?"	Validate numbers if fish are available. Do not include Walleye Pollock or Pacific (grey) cod.
"Of the sablefish you kept, how many did you clean at sea?"	This number cannot exceed the number of sablefish kept.
"How many sablefish did you release?"	Include all sablefish released, regardless of release condition.
"How many walleye Pollock did you keep?"	Validate numbers if fish are available. Do not include sablefish (black cod) or Pacific (grey) cod.
"Of the Pollock you kept, how many did you clean at sea?"	This number cannot exceed the number of walleye Pollock kept.
"How many pollock did you release?"	Include all Pollock released, regardless of release condition.

3) At this point you can simply ask if any sharks were caught. If any were, repeat the last three questions for all applicable shark species.

Appendix C2.–Data fields for Data Plus Professional interview data application program (DataPlus CE Professional Version 3.05.0) deployed on an Allegro CX field PC (Juniper Systems).

Field	Description	Format	Valid entries
PORT	Port of landing (except is sublocation in CCI application)	Text	Kodiak, Homer, DC (Deep Creek), AP (Anchor Point), Seward, Whittier, Valdez
DATE	Date	MM/DD/YEAR	Autoentry
NAME	Name of port sampler	Text	
SURVEYAREA	Standard SF Division site codes	Text	Autoentry
BOATNAME	Name of boat	Text	
LOGBOOK	ADF&G logbook number	Integer	180000–183600
INT_TIME	Time of interview	HHMMSS	Autoentry
TRIP	First or second trip of the day	Integer	1 or 2
TOT_DAYS	Duration of trip in days (number of days fishing)	Integer	1-9
USER_GRP	User group (charter/private)	Text	C or P
TARGET	Target species category	Text	B (bottomfish), B+S (bottomfish & salmon), H (halibut), L (lingcod), R (rockfish), S (salmon), SSK (salmon shark), O (other finfish – must describe the target finfish in comments section)
STATAREA	ADF&G groundfish statistical area	Integer 6	Port-specific values in drop down list
INT_AREA	Interview area; varies by harbor	Integer	1-5
IN_OUT_BAY	Use to indicate whether the boat was fishing inside or outside Resurrection Bay (or both)	Text	I (inside), O (outside), B (both)
CLIENTDAYS	Number of angler-days of effort by clients and comps (anglers that fish for free)	Integer	0-99
CREW_DAYS	Number of angler-days of effort by skipper and crew	Integer	0-9
HOURSFISHED	Number of hours of fishing time – time spent fishing and moving between fishing spots.	HH:MM (nearest 15 min)	0.25-100

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Field	Description	Format	Valid entries
HA_KPT	Number of halibut kept	Integer	0-60 with bag limit check
HA_KPT_VER	Verified the number of halibut kept	Text	Y (yes) or N (no)
HA_CAS	Number of halibut cleaned at sea	Integer	0-60
HA_REL_CIR	Number of halibut released that were caught on circle hooks	Integer	0-99
HA_REL_OTH	Number of halibut released that were caught on all other hook types	Integer	0-99
P_KPT	Number of pelagic rockfish kept	Integer	0-150 with bag limit check
P_KPT_VER	Verified the number of pelagic rockfish kept	Text	Y (yes) or N (no)
P_CAS	Number of pelagic rockfish cleaned at sea	Integer	0-150
P_R_SURF	Number of pelagic rockfish released at the surface except those fish that were vented or fizzed.	Integer	0-99
P_R_DRM	Number of pelagic rockfish released at the depth of capture with deepwater release mechanism	Integer	0-99
P_R_VENT	Number of pelagic rockfish vented or fizzed and then released.	Integer	0-99
P_R_DEPTH	Average depth of capture (in feet) for pelagic rockfish that were released	Integer	0-999
YE_KPT	Number of yelloweye rockfish kept	Integer	0-150 with bag limit check
YE_KPT_VER	Verified the number of pelagic rockfish kept	Text	Y (yes) or N (no)
YE_CAS	Number of yelloweye rockfish cleaned at sea	Integer	0-150
YE_R_SURF	Number of yelloweye rockfish released at the surface except those fish that were vented or fizzed	Integer	0-99

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Field	Description	Format	Valid entries
YE_R_DRM	Number of yelloweye rockfish released at the depth of capture with a deepwater release mechanism.	Integer	0-99
YE_R_VENT	Number of yelloweye rockfish vented or fizzed and then released.	Integer	0-99
YE_R_DEPTH	Average depth of capture (in feet) for yelloweye rockfish that were released	Integer	0-999
NP_KPT	Number of other non-pelagic rockfish kept	Integer	0-60 with bag limit check
NP_KPT_VER	Verified the number of other non-pelagic rockfish kept	Text	Y (yes) or N (no)
NP_CAS	Number of other non-pelagic rockfish cleaned at sea	Integer	0-30
NP_R_SURF	Number of other non-pelagic rockfish released at the surface except those that were vented or fizzed.	Integer	0-99
NP_R_DRM	Number of other non-pelagic rockfish that were released at the depth of capture with a deepwater release mechanism.	Integer	0-99
NP_R_VENT	Number of other non-pelagic rockfish that were vented or fizzed then released.	Integer	0-99
NP_R_DEPTH	Average depth of capture (in feet) for other non-pelagic rockfish that were released	Integer	0-999
LC_KPT	Number of lingcod kept	Integer	0-60 with bag limit check
LC_KPT_VER	Verified the number of lingcod kept	Text	Y (yes) or N (no)
LC_CAS	Number of lingcod cleaned at sea	Integer	0-60
LC_REL_OVR	Number of lingcod released that were 35 inches or greater in total length	Integer	0-99
LC_REL_UND	Number of lingcod released that were under 35 inches total length	Integer	0-99

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Field	Description	Format	Valid entries
PCOD_KPT	Number of Pacific cod kept, includes those used for bait.	Integer	0-99
PCOD_KPT_VER	Verified the number of Pacific cod kept	Text	Y (yes) or N (no)
PCOD_CAS	Number of Pacific cod cleaned at sea (include those caught and used for bait)	Integer	0-99
PCOD_REL	Number of Pacific cod released	Integer	0-99
SAB_KPT	Number of sablefish (black cod) kept	Integer	0-99
SAB_KPT_VER	Verified the number of sablefish kept	Text	Y (yes) or N (no)
SAB_CAS	Number of sablefish cleaned at sea	Integer	0-99
SAB_REL	Number of sablefish released	Integer	0-99
POL_KPT	Number of Pollock kept	Integer	0-99
POL_KPT_VER	Verified the number of Pollock kept	Text	Y (yes) or N (no)
POL_CAS	Number of Pollock cleaned at sea	Integer	0-99
POL_REL	Number of Pollock released	Integer	0-99
SS_KPT	Number of salmon sharks kept	Integer	0-99
SS_KPT_VER	Verified the number of salmon sharks kept	Text	Y (yes) or N (no)
SS_CAS	Number of salmon sharks cleaned at sea	Integer	0-99
SS_REL	Number of salmon sharks released	Integer	0-99
SD_KPT	Number of spiny dogfish kept	Integer	0-99
SD_KPT_VER	Verified the number of spiny dogfish kept	Text	Y (yes) or N (no)
SD_CAS	Number of spiny dogfish cleaned at sea	Integer	0-99
SD_REL	Number of spiny dogfish released	Integer	0-999
SLP_KPT	Number of sleeper sharks kept	Integer	0-99
SLP_KPT_VER	Verified the number of sleeper sharks kept	Text	Y (yes) or N (no)
SLP_CAS	Number of sleeper sharks cleaned at sea	Integer	0-99
SLP_REL	Number of sleeper sharks released	Integer	0-99
COMMENTS	Unrestricted comments.	Text	

APPENDIX D: AGE-READER PRECISION STANDARDS MEMO

Appendix D1.–Gulf of Alaska bottomfish (GOAB) age-reader precision standards memo.

ALASKA DEPARTMENT OF FISH AND GAME

DIVISION OF SPORT FISH

MEMORANDUM

TO: **Jack Erickson**

DATE: January 10, 2009

FROM: **Barbi J. Failor**

TELEPHONE: (907) 235-1731

SUBJECT: GOAB Age-Reader Precision Standards

In researching the history of the age determination portion of the Gulf of Alaska Bottomfish Assessment Program (GOAB), it has been determined that standards need to be documented in order for an age-reader to progress from the training and calibration level of ageing to production level ageing. This memo covers the current training process (including precision thresholds, training time and calibration sets), options for specifying objective criteria, standards utilized in other in-state age programs, and proposed age-reader agreement standards for the Gulf of Alaska Bottomfish Assessment Program.

The current training process utilized in the GOAB ageing program begins with the new personnel reviewing the CARE (Committee of Age-Reading Experts) Ageing manual. This manual provides an excellent overview and introduction to age structure preparation, storage, and ageing procedures. Following review of the CARE manual, the trainee ageing technician will spend time at the teaching scope with an experienced reader looking at prepared age structures to begin learning about the age structures and associated patterns to look for when ageing. Initial time at the teaching scope may range from two hours to a full day but on average will be three to four hours. Following the trainee's introduction at the scope, he or she is given a prepared set of age structures to assign ages to. Upon completion of the first set of age structures, ages are compared with ages assigned by an experienced reader (between reader calibration), at which point structures with discrepancies are taken to the teaching scope to be resolved. This pattern continues until the trainee reaches a set of mainly qualitative thresholds of precision which differ a bit dependent on species and age structure utilized.

The precision thresholds for repeatability are analyzed both between readers (between reader drift and calibration precision testing) and within a readers own assigned ages (within reader precision testing) in determination of whether a trainee is ready to move on to production ageing. We take into consideration not only percent agreement (both within and between reader) but also the distribution of errors. New age readers train with experienced agers until precision rates fall within acceptable levels. The problem is that these precision levels are subjective targets, unrelated to any documented scientific approach. Preferred percent agreement for the GOAB program (both between and within readers) for black rockfish has been 66-70% with 90% of errors falling within ±1 year. For all other species 50% agreement is desired with 90% of errors falling within ± 2 years. In summarizing the distribution of errors, it is desirable that the error distribution has a mode of zero and that these differences are

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unbiased and roughly symmetrical about that mode of zero. Error distribution plots, age bias plots and chi-square tests for bias between readers have been utilized in this regard.

Time to production ageing from beginning trainee differs dependent on the species being aged, but for black, dusky and dark rockfish a trainee will typically begin production ageing within 5 days. For yelloweye rockfish this may be as long as 7-9 days on average. Miscellaneous rockfish species are more difficult to age, but typically aged last and at this point yelloweye ageing has prepared the ager to move directly into ageing the misc rockfish species with no time needed for calibration. Lingcod are aged by means of mounted thin sections of dried prepared fin-ray spines. Preparation of the lingcod fin-rays allows the ager to become familiar with the fin-ray annuli, and calibration for lingcod fin-rays takes 2-3 days on average following extensive age-structure preparation time. Experienced agers typically re-calibrate within 2-3 days then move on to production ageing. As GOAB age determination is only conducted seasonally, age readers must re-calibrate each season with previously aged age structure, for most of the species aged as noted above.

Ideally, for training purposes, there would be a reference set of age structures for each species. In the absence of a reference set of age structures, structures with ages already assigned by an experienced reader are used for training. Utilizing previously aged sets of rockfish otoliths in training works for a time, but degradation of the age structure over multiple bakings, cleanings and general handling can introduce error in the age estimation process. The development of reference sets of rockfish otoliths would benefit the age program in providing a consistent standard for training new agers and for the continued evaluation of experienced readers. A reference set of thin section mounts of rockfish otoliths aged by several experienced agers can also be used to standardize ages from different readers using a classification matrix which would be useful considering the high turnover in seasonal staff. Sectioned and mounted lingcod fin-rays provide the basis for development of a reference set for lingcod, however, fin-ray interpretation can be challenging with the prominence of resorbed annuli occurring in the fin-rays. The GOAB program is beginning to investigate the differences between the use of thin sectioned lingcod fin-rays and lingcod otoliths in obtaining the most accurate and precise age estimates.

There are options to consider when specifying precision criteria for a trainee age reader to move on to production ageing such as average percent error (APE), percent agreement, acceptable limits of error (e.g. percentage of errors lying within ± 2 yrs), age bias plots, chi-square test for bias between age readers and available time/funding for age determination personnel. Precision standards and training time allowed to meet these standards vary due to the nature of the ageing program.

The ADF&G Commercial Fisheries Age Determination Unit (ADU) utilizes APE as their measure of precision and has a desired APE for not only each species of fish, but in some instances by separate stocks of a species. While APE appears to be the determinant as to whether a trainee is ready to advance to production ageing, this says nothing about the associated bias. The ADU is a year-round ageing facility and this is all the dedicated (ageing) staff does, so their precision standards are fairly tight though undocumented. The ADU can spend up to three or four months training and calibrating a new staff member before the ager is ready to move into production ageing though some will not show an aptitude for ageing and this is the time period used for determining the presence or absence of that aptitude.

ADF&G's Commercial Fisheries unit in Homer does not have precision standards, but has had a consistent pair of agers for several years and tracks within-reader agreement using percent agreement and tracking of year classes. It has been quite some time since they had a new age reader to train. Bi-annually the FB I in the program travelled to the Juneau ADU to conduct training and age validation exercises. This training shows their precision remains consistent and allows for correction of straying in ageing on a regular basis.

All three programs (ADU, Homer Comm. Fish, and GOAB) conduct exchanges of age structures and attend the Committee of Age Reading Experts (CARE) meetings to keep abreast of the latest developments in age reading technologies and work to resolve inter-agency discrepancies in ageing. Age structure exchanges also allow for age validation and evaluation of drifting between departments and agencies helping to ensure that those conducting training of new age readers are not introducing new sources of error.

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Overall, choosing criteria by which to judge that a new age-reader is ready to move from training to production status is a subjective matter, because: (a) an acceptable level of error depends largely on what the age data are going to be used for, and (b) the error structure can be corrected or adjusted before being used in various analyses or assessments.

I propose maintaining the current agreement standards for the GOAB program which are as follows:

Species and/or Complex	Within Reader Agreement Precision	90% within	Between Reader / Reference Agreement Precision	90% within
Lingcod	50%	± 2 years	50%	± 2 years
Black Rockfish	70%	± 1 year	70%	± 1 year
Dusky Rockfish	50%	± 2 years	50%	± 2 years
Dark Rockfish	50%	± 2 years	50%	± 2 years
Yelloweye Rockfish	50%	± 2 years	50%	± 2 years
Salmon Shark	50%	± 2 years	50%	± 2 years
Spiny Dogfish	50%	± 2 years	50%	± 2 years
Miscellaneous Rockfish Species	50%	± 2 years	50%	± 2 years

New personnel should be able to meet the standards for black rockfish within 10 working days (2 calendar weeks), and standards for the remaining species within 15 working days (3 calendar weeks). Returning personnel should be able to meet these standards within half these proposed times.

As black rockfish are the easiest to read, the desired within-reader and between reader/reference agreement precision is set at seventy percent with ninety percent of the age estimates falling within ± 1 year, an even distribution of estimates around a mode of zero (perfect agreement) and no apparent age-related bias. For the remaining species specified along with the miscellaneous rockfish group, a fifty-percent within-reader and between reader/reference agreement rate is desirable with ninety percent of the age estimates falling within ± 2 years, along with an even distribution of errors around a mode of zero and no apparent age-related bias. Due to their low sample size numbers and variability in species sampled among ports the remaining rockfish species fall into the category of Miscellaneous Rockfish Species. If sample sizes of some of the Miscellaneous Rockfish species increase, this program may consider setting species-specific targets on those species. As these are subjective targets, future changes may be necessary dependent on what the data come to be used for and what the impact of any associated ageing error may be.

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